The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Contents

NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Standardisation of Works Materials

THOSE who attended the joint meeting of the Institution of Mechanical Engineers with the Society of Chemical Industry last week, expecting to have the whole theory of the relation of chemist and engineer explained, may have suffered some momentary disappointment. In his paper on "The co-operation of the engineer and chemist in the control of plants and processes," Mr. G. M. Gill nearly succeeded in avoiding all reference to the theory of the subject. He supplied, however, three very serviceable examples of the waste and inaccuracy which result from the non-employment of the chemist's services in connection with gasworks materials. Convincing diagrams were exhibited, showing the large and ever-varying percentage of dirt found in coals supplied to gasworks, and the advantage to be gained by the application of physical and chemical tests at the colliery. A yet more striking example of avoidable inaccuracy was furnished by the case of refractory materials. Illustrations were shown of retorts varying in internal capacity to a considerable extent and of firebricks showing correspondingly inconsistent dimensions. The author had no difficulty in carrying his hearers, who had had practical experience of these difficulties, completely with him in his plea that the makers of refractory materials should begin to employ rational methods in the control of the ingredients used, and in their mixing, drying, and burning. In short, he asked for the institution of methods providing for: (1) the continuous sampling and analyses of mixtures in use, both chemical and physical; (2) the use of heat recorders in kilns; (3) definite limiting standards in size and shape; and (4) guaranteed working to specifications. Finally, the system in use by the South Metropolitan Gas Company for securing a standard quality of gas was described, and it was shown that on a total daily expenditure of £714 a fairly complete system of control by means of chemists and testers could be provided for the trifling additional sum of £3 8s. per twenty-four hours.

In the discussion which followed comparisons unfavourable to this country were made with both German and French products, and the blame for the present unsatisfactory condition of things was attributed mainly to the influence of the so-called "commercial" man, generally much too readily disposed to achieve cheapness at the cost of efficiency. The practical remedy, as several speakers pointed out, lies in a firm refusal to be content with unsatisfactory articles and insistence upon a reasonable standard of scientific accuracy. This may result in a slight increase of the purchase price, but an increase certain to be recovered many times over in the higher degree of works efficiency. The Society of Chemical Industry was mainly represented in the discussion by members of the Chemical Engineering Group, and the contributions from Dr. Ormandy, Mr. Reavell, Mr. Alliott, and Professor Hinchley were among the most interesting and practical.

Is Shale Oil Profitable?

OUR remarks last week on the indifferent results which have attended the attempts to establish a native oil industry have led one of our readers to inquire whether the mining of shale as a source can ever hope to succeed commercially either in this country or in any other. From opinions we have given on several previous occasions it will be gathered that we have no very great faith in the money-earning capacity of processes involving the distillation of shale; on the other hand, one has to bear in mind that the Scottish industry was set going so long ago as 1852, and with various ups and downs it has managed to continue in existence. It is as well to note, however, that fifty years ago there were over fifty concerns engaged in the industry in Scotland, while at the present time there is only one, which is a consolidation of the five largest companies. It has been said that success has been achieved solely through efficient

organisation, high technical skill, the employment of labour-saving devices, and operation on a large scale. A product which has always been of prime importance is sulphate of ammonia, and that the recovery of this has been on a progressive scale is shown by the fact that whereas since 1870 the output of oil has been approximately trebled the output of sulphate has been increased from about 2,300 tons to nearly 60,000 tons. By-products and solid products, such as paraffin wax, undoubtedly have an important influence on the balance sheet, and it is very essential to bear this in mind when considering the prospects of newly-developed concerns. Attention again has been drawn to the fact that the manufacture of good lubricating oils requires men of extensive training and experience, and that the manufacture of lubricating oils from shale must necessarily demand a great deal of research and experimental work, while it may never be possible to make the more viscous grades of lubricants.

Perhaps the most valuable summary of the whole position is given in a Report which the U.S. Bureau of Mines issued in June of last year. Here it was pointed out that the shale-oil industry is not strictly comparable with the petroleum industry. After the oil has been removed from the shale the problems connected with its refining are much more complex than are those of refining petroleum. Obtaining oil from shale is not comparable with obtaining crude oil by drilling. In drilling an oil well the element of chance has to be taken into consideration, but there is always the possibility of a large immediate reward on a relatively small investment. After oil has been struck the cost of transporting it to the refinery is in most cases relatively small, as there are systems of pipe lines throughout the oil fields. It must be realised that the production of oil from shale is a large-scale manufacturing enterprise that involves the handling of large amounts of low-grade material. It may be compared in many respects with the extraction of gold or copper from low-grade ores. The original investment for equipment is heavy, the operating expenses high, the profit per ton probably small, and a large daily capacity and good management are essential for profits. There is some probability that in years to come the production of petroleum may so decrease and the demand so increase that oil shales may be largely needed to supply the deficiency, but it is instructive to note, so far as the industry in this country is concerned, that although the Scottish undertakings have been in existence for more than fifty years the amount of shale oil produced in Scotland in 1920 was less than two days' average production of crude oil in the United States during the same year.

The Preservation of Wood

As a good deal of inquiry was attracted by some comments which appeared a few months ago in these columns in connexion with the preservation of wood it may not be out of place to refer to some recent work which has been conducted in America with low-temperature tar oils. It is claimed that creosote oils obtained from the distillation of low-temperature tars are considerably better than those obtained from the tars distilled from coal in the ordinary high-temperature processes. Some authorities ascribe their superiority as wood preservatives to their high content of tar acids, while others consider that it is due to the oxygenation of the unsaturated hydrocarbons of which the low-temperature oils are largely composed. The oxygenation of the hydrocarbons tends to convert them from liquids to solids which form a more permanent filler for the cell walls in the wood. F. P. Coffin has stated that the amount of creosote used in treating hard woods and soft woods does not differ materially for the same degree of penetration. Some purchasers of soft yellow pine will call for a high penetration and heavy injection, while others treating hard wood are satisfied with a light penetration with a corresponding light injection. This is purely a matter of the opinion of the purchaser ; if the material is an expensive one, having a greater natural resistance to decay, he may try to save on the amount of creosote injected, while if he purchases a cheap wood he figures that he can afford to spend more money on the preservative. Some authorities prefer the heavy injection in all cases and consider that the protection secured is ample to compensate for the additional expenditure. Well-creosoted woods have, in some instances, lasted from fifteen to thirty years, and the mechanical wear becomes the limiting factor in their useful life.

An economic point in the problem of wood preservation which is frequently overlooked is that when one considers the more extended purposes for which wood is used—*e.g.*, telegraph poles and railway sleepers —there is an enormous reduction to be effected in consumption when the life of the material is carried to a maximum by the utilisation of effective preservative agents.

Technology of Caustic Magnesia

We learn that co-operative work of the United States Bureau of Mines with the North-West Magnesite Co., on the technology of caustic magnesia has been completed at the Pacific Experiment Station, Berkeley, Cal. Caustic magnesia is used for the manufacture of Sorel cement, or oxychloride cement, which is extensively employed for interior finishing, such as stucco and flooring. The properties of this cement, particularly in relation to the process of the manufacture of caustic magnesia, are not well understood, and thorough development of the technology might considerably extend its use. The work already done by the Bureau of Mines has secured for the first time the correlating conditions under which caustic magnesia is produced with the properties exhibited by the cement. The chief results of this investigation may be summarised as follows :

High-grade caustic magnesia can be made from certain varieties of magnesite hitherto considered unsuitable for the purpose. Test runs with a modern type of mechanical furnace indicate that such a furnace can be used commercially for calcining magnesite to produce caustic magnesia. Comprehensive tests have been developed for determining the properties of caustic magnesia as regards oxycholoride cement manufacture. Standard specifications for caustic magnesia have been developed in co-operation with manufacturers, producers, and users of caustic magnesia. Fundamental data on the rate of decomposition of various kinds of magnesite have been obtained.

Other problems studied in connexion with these tests included the effect of time and temperature of

burning, effect of storage and exposure to air, and effect of free lime on the properties of the product, as well as the effect of silica on the burning behaviour of the magnesite.

An Empire Dyestuffs Policy

SIR WILLIAM ALEXANDER's communication to THE CHEMICAL AGE last week, the keynote of which was the urgent necessity for the inauguration of a policy whereby the production of British dyes might be absorbed within the British Empire, has, we understand, aroused a considerable amount of interest and discussion. From the known production of dyestuffs in Germany, the United States, and Switzerland alone, it is obvious that the world's consumption is far below its capacity to produce, and the success of the dyestuff making industry depends on the securing of adequate outlets, both present and future. That a considerable and firmly-established British production is desirable is admitted even by uncompromising Free Traders, although the opinion is freely expressed that this is at present rendered practically impossible by the restrictions of bureaucratic departmental control. There is also a tendency in certain quarters to regard the present dyestuffs policy—in the formulation of which the late Lord Moulton played so prominent a part—as having served its purpose, and a readiness to reconsider the position. The action of Australia in regard to Empire preference, the letters we have received from business men in Canada and other Dominions, and the personal experiences of those who attended the annual meeting of the Society of Chemical Industry in Canada, all show that there is a genuine desire on the part of the British Colonies and Dependencies to act reciprocally in trading, as far as possible, with Great Britain.

In a matter of such vital interest to the nation it is of the highest importance to have the best judgment of all parties concerned, and Sir William Alexander's statement promises to elicit some valuable practical opinions on the problem. Even those who may differ from him on details are in cordial agreement with his high estimate of British scientific and commercial capacity. The complaint of some of them, in fact, is that our scientists and practical men have not had sufficiently full opportunities in the past. It is obvious that the situation calls for the utilisation of our best resources, and it is to be hoped that the discussion stimulated by Sir William Alexander's statement will bring all parties nearer to agreement on a sound national policy.

Key Industry Appeals

IT may have escaped the notice of many that Saturday, January 7, was the last day for lodging objections to the list of dutiable articles issued by the Board of Trade under Part I. of the Safeguarding of Industries Act. Those affected by the list, however, have not overlooked the limits to their period of grace. The Chemical Merchants and Users National Vigilance Committee have handed in objections to no fewer than 120 articles, while numerous objections have been laid by other bodies. In the majority of cases the objection is to the inclusion of articles held to have been wrongly brought within the scope of the Act, but several others remain in which the complaint is that the list is not wide enough in its application. Up to now four cases have come before the official Referee. Two have been decided, in each case against the Board of Trade, and two are still the subject of inquiry. At the present pace the inquiries promise to secure the Referee against unemployment for some years to come.

Points from Our News Pages

The subject of Dr. Stephen Miall's second article in the series on recent chemical theories is "Radio-Active Changes" (p. 34).

Reviews of recently published works on chemistry are contributed by various writers (p. 36).

In the discussion following a paper by Mr. G. M. Gill on the co-operation of chemist and engineer in the control of plants and processes several members of the Chemical Engineering Group took part (p. 38).

Results of an investigation into the physical properties of pure and mixed fuels were given at a meeting of the Institution of Petroleum Technologists (p. 40).

The discovery of a new tannin in a plant closely allied to the cocoa plant is announced (p. 52).

Our monthly London market report records marked stagnation during the past week, with signs, however, of a slightly improving demand later (p. 49).

Our Scottish market report states that the year has opened in a hopeful spirit but that so far there is an absence of material inquiries for chemicals (p. 52).

The Calendar

Jan.		
16	Chemical Industry Club: "What is a Fine Chemical?" W. J. U. Woolcock, M.P.	2 Whitehall Place, London.
16	Society of Chemical Industry, London Section: "Further Experiments with Activated Sludge." E. Hannaford Richards and G. C. Sawyer. 8 p.m.	Burlington House, Piccadilly, London
17	Royal Institution of Great Britain: "Physiology as Applied to Agriculture." F. H. A. Marshall. 3 p.m.	Albemarle Street, London.
17	Hull Chemical and Engineering Society: "Modern Electricity Supply." H. Bell. 7.30 p.m.	Wilberforce Café, Waterworks Street, Hull.
18	Society of Glass Technology. Meeting. 2.30 p.m.	The University, Sheffield.
19	Chemical Society: Ordinary Scientific Meeting. 8 p.m.	Burlington House, Piccadilly, London.
19	Society of Dyers and Colourists, West Riding Section: "The Status of a Dyer." J. E. Brierley.	Bradford.
19	The Chemical Society: "Models of the Lewis-Langmuir Atom, with Explanations" Professor A. Smithells. 8 p.m.	Burlington House, London.
20	Royal College of Science Chemical Society: "Over-Specialisation." W. Randerson. 5 p.m.	Royal College of Science, S. Kensington.
20	Royal Institution of Great Britain: "Soap Films and Molecular Forces." Sir James Dewar. 9 p.m.	Albemarle Street, London.
20	Society of Dyers and Colourists, Manchester Section: "Some of the Causes of the Staining of Printed Fabrics, with some General Remarks on Moulds." Dr. E. J. Sidebotham. "Some Notes on Hyperchlorous Acid and Chlorine." R. L. Taylor.	Manchester.
20	Society of Dyers and Colourists, Scottish Section: "Scouring and Milling." J. Schofield.	—

Notes on Some Recent Chemical Theories

II.—Radio-Active Changes

By Dr. Stephen Miall

A BRIEF notice of some of the leading features of radio-activity has already been given, and it is now the time to trace some of these in detail, but before doing this it is as well to mention that in all radio-active changes a definite fraction or percentage of a radio-active atom undergoes change in any particular period of time. Thus if 5 per cent. of an atom changes into some other element in the first year, 5 per cent. of the remainder will similarly change into the other element in the next year, and so on. The various changes have been studied by the Curies, Rutherford, Boltwood, Debierne, Fleck, Soddy, and many others, and their results are as follows :

U_{11} by losing another β-particle. So rapid is this change that half the substance changes in about a day and a half. U_{11} is chemically similar to uranium, but has an atomic weight of only 234. It undergoes change at such a rate that half is converted in twenty-four days ; the change is two-fold, about 92 per cent. of it being occasioned by the loss of an α-particle to form ionium, similar in chemical properties to thorium and having an atomic weight of 230. Ionium is a slow changing substance, the time for transformation of half being some 20,000 years. Its change is due to the loss of an α-particle, thereby reducing its atomic weight to 226 and forming radium, an element chemically

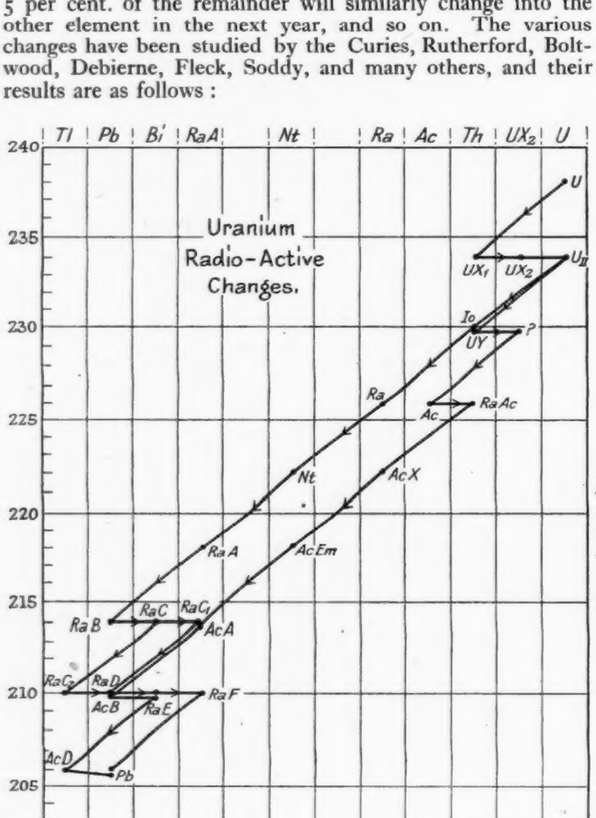

FIG. 1.

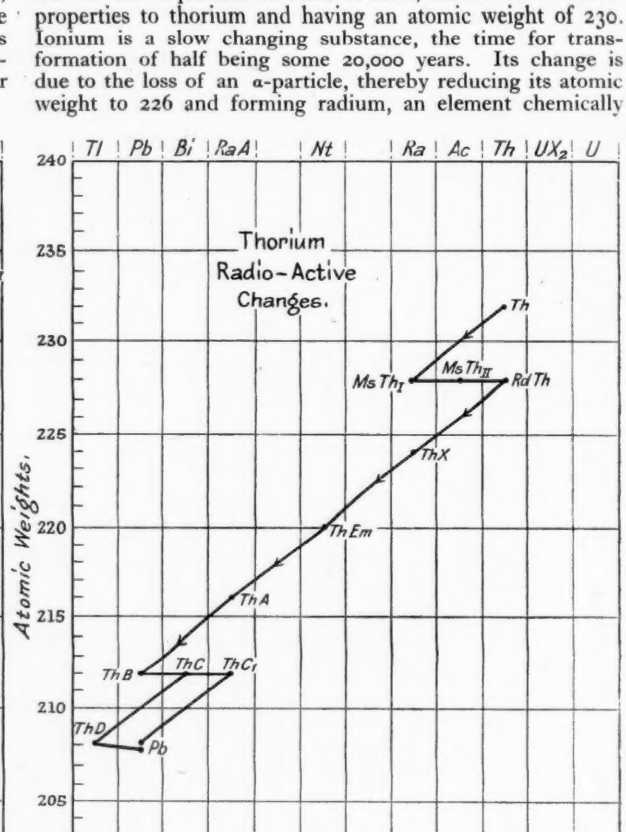

FIG. 2

Uranium is the original source of many of the radio-active substances. It has an atomic weight of 238, and, unlike most of the radio-active elements, has been prepared in large quantities. Very slowly it undergoes a change, so slowly that it takes about 5,000 million years for half of any quantity of uranium to be changed. The change begins by the loss of an α-particle, reducing the atomic weight to 234 and forming a new radio-active element, known as UX_1, which in chemical properties is similar to thorium. UX_1 undergoes a slow change, half of it being converted in about a million years to an element UX_2 ; this change is not due to the loss of an α-particle but to the loss of a β-particle or electron. Now the loss of a particle of negative electricity is equivalent for most purposes to the addition of a positive charge of electricity, and this means that the element has as atomic number 1 greater than before and occupies a higher place, the next place higher up, in the periodic table. The new element UX_2 has not been prepared in any quantity, as it undergoes a very rapid conversion into

somewhat like barium and strontium. The atomic weight of radium has been determined by Madame Curie, Sir Edward Thorpe, and others, and found to agree very well with its theoretical atomic weight, calculated by deducting the weight of 2 helium atoms or α-particles from the atomic weight of uranium. Radium has a half transformation period of about 2,000 years and gives off an α-particle and the emanation called niton, which, as already mentioned, resembles the other inert gases. Niton has a short life and a gay one, giving off an α-particle and forming Radium A, a solid body with a rate of half-transformation in rather more than three days. Radium A gives off another α-particle to form Radium B, which cannot chemically be distinguished from lead, but has an atomic weight of 214 and a half-transformation period of less than half an hour. Radium B throws off a β-particle, thereby adding 1 to the atomic number and producing Radium C, which is chemically indistinguishable from bismuth. Radium C changes in two ways, part throws off an α-particle forming RaC_2, which

throws off a β-particle, making RaD indistinguishable from lead, the other part of Radium C throws off a β-particle to form RaC_1, which, by the loss of an α-particle, forms RaD, which throws off a β-particle to form RaE; RaE loses a β-particle to form RaF, and this loses an α-particle to form a sort of lead with an atomic weight of 206, but otherwise identical with the pig lead, which can be bought by the 100 tons on the Metal Exchange.

It has already been stated that when the element U_{11} undergoes change the change is two-fold, and we have traced the descent of 92 per cent. of the change. It remains to consider the other 8 per cent. The first stage in this change is difficult to prove but probably by the loss of an α-particle, a body almost identical with ionium is formed, which gives off a β-particle to form an element chemically similar to UX_2. Whether this first stage of the 8 per cent. change is proved or not the remaining stages have been fairly definitely determined. The next stage is the loss of an α-particle, and the formation of the element actinium allied more or less to the rare earth elements. Actinium gives off a β-particle to form RaAc, very similar to UX, and ionium. The atom of RaAc loses an α-particle forming AcX, and this loses another α-particle, forming an emanation or inert gas called the actinium emanation, and having an atomic weight of 218. The emanation loses an α-particle to form AcA, which loses an α-particle to form AcB. This loses a β-particle to form AcD, which itself loses a β-particle to form an element chemically identical with lead but having an atomic weight of 206. These changes are set out in diagram No. 1, and diagram No. 2 shows the elements which result from the disintegration of thorium. It is remarkable that from uranium in course of time two elements are formed which are chemically identical with lead, but have atomic weights of 210 and 206 respectively, in addition to the one formed by actinium, which also has an atomic weight of 206. Also from thorium a variety of lead is formed which has an atomic weight of 208. Elements with identical chemical properties but different atomic weights have been christened "isotopes" by Professor Soddy, and the isotopes of lead have had their atomic weights determined by a number of experimenters. In 1914 Professor Richards and Mr. Lembert determined the atomic weights of lead obtained from a number of uranium minerals, and found them to vary between 206.4 and 206.8, whereas the atomic weight of ordinary lead is about 207.15. And Professor Soddy and Mr. Hyman have determined the atomic weight of lead derived from thorite, and found it to be about 207.7. Since those determinations were made Dr. Aston, of Cambridge, has shown that neon, chlorine, and many other elements are mixtures of isotopes. His experiments will be described in detail hereafter, but for the moment it is sufficient to state that many elements in addition to the radio-active elements have isotopes, that is, there exist varieties of the element which have different atomic weights but identical chemical properties. This is only another way of stating the fact that some part of the mass of the atom has no effect on its chemical properties. In THE CHEMICAL AGE of February 14, 1920, and April 3, 1920, I endeavoured to show from purely mathematical considerations that all atomic weights were of the form $2x+a$, where X was the atomic number and "a" usually a small integer. It now appears to me that this is being proved—by others who know far more of the subject than I do—to be true. I think when I wrote the article the point was a novel one, but it is obvious that the minds of those who had really worked at the subject were in many cases tending to come to some such conclusion, although they had not happened to light on my particular method of approaching the subject.

When an atom loses a β-particle it usually happens that the new atom belongs to an element belonging to the next higher place in the list of elements, and this is usually accompanied by a change of valency. Now it is supposed by many physicists and chemists, Thomson, Rutherford, Bohr, Vegard, Langmuir, and others, that chemical activity, and especially valency, mainly depends on the number of electrons in the outer sphere of the atom. It is plain that when a radio-active element loses an electron and forms a new element with a valency one more than the original element—as often happens—there must be some rearrangement of the electrons in the atom. Had one of the outer electrons split off the valency would be decreased. An electron must in such cases as we are considering be split off from the inside, and simultaneously another electron leaves the inside and takes up a position on the outside sphere. Professor Soddy suggests that the β-particle which is lost comes from the nucleus itself, and this seems to be highly probable. Naturally it will be pointed out that a change in atomic number is not necessarily accompanied by a change of valency; for instance, consider iron, cobalt, and nickel, and the numerous rare earth elements. We must conclude from these facts that, in addition to the nuclear mass, which is capable of losing a considerable number of helium atoms, there are external electrons causing valency, middle electrons, capable of coming to the outside when sufficiently stirred up, and probably electrons lodged on or very close to the nucleus. I suppose an electron actually lodged on the nucleus would counteract the effect of one of the positive charges of electricity of the nucleus, and thereby bring two units of the nucleus into the state of dead weight which I dealt with in my former articles in THE CHEMICAL AGE.

The helium atom on the theory outlined above has a nucleus of mass 4, with two positive charges on it and two external electrons; the next element lithium exists in two isotopic forms with atomic weights of 6 and 7 respectively. That with atomic weight 6 would have a nuclear mass of 6, enough to make one and a half helium atoms or one helium atom and two hydrogen atoms; it would have 3 positive charges on the nucleus and three electrons, two on an inner sphere or ring and one outside causing it to be a monovalent element. The isotope with atomic weight of 7 will be precisely similar except that the atomic nucleus will have a mass of 7 instead of 6. What the odd unit is must remain a matter of conjecture; it seems to consist of the same sort of substance as the rest of the nucleus, but either it has not electric charge on it or its positive charge has been neutralised. I am not sure whether there is any real difference between these alternatives or whether the difference is merely one of words. In any case the odd unit of matter is chemically dead. Beryllium is the next element, and it has a nucleus of mass 9 and 4 positive charges, there are 4 electrons supposed to be two in an inner ring and two in an outer one. Then we come to boron with an atomic number of 5 and atomic weight 11; it has a nucleus of mass 11 with 5 positive charges, also has 5 electrons, 2 in an inner ring and 3 in the outer ring. One unit of the boron nucleus seems to be the same sort of unit as the odd one of lithium. Carbon has a nucleus of mass 12 and 6 positive charges; its atomic number is 6, and it has, therefore, 6 electrons, 2 in an inner ring and 4 in an outer ring corresponding to a valency of 4. Fluorine is supposed to have a nucleus of mass 19 with 9 positive charges and 9 electrons, 2 in the inner and 7 in the outer ring, and so we pass on to the next element neon, the atom of which involves some considerations of isotopy and X-ray radiations, which we will deal with in a subsequent article.

THE annual meeting of the Society of Public Analysts will be held on February 1, at the Chemical Society's Rooms, Burlington House, Piccadilly, London, W. An ordinary meeting will be held after the annual meeting, when the following papers will be read: "Studies in the Titration of Acids and Bases," by J. L. Lizius and N. Evers; "The Sulphuric Acid Reaction for Liver Oils and its Significance," by J. C. Drummond and A. F. Watson; and "The Quantitative Separation of Nitrobody Mixtures from Nitro-glycerine," by W. Dickson and W. C. Easterbrook.

Reviews

PATENTS AND CHEMICAL RESEARCH. By H. E. POTTS, M.Sc. The University Press of Liverpool. Pp. 198. 8s. 6d.

This book is an attempt to guide those who are engaged in industrial chemical research to an understanding of the leading principles of patent law and practice, and to enable them to make full use of the patent system in protecting the results of their research. The problem which faces the chemical inventor is different in many vital respects from that which faces the inventor of a machine or an apparatus. The latter has something tangible to protect, and something which can readily be described and defined, and any infringement of which is usually obvious. The chemist, on the other hand, usually seeks protection for a process, an abstract thing, which requires great care in defining in terms which are sufficiently precise to comply with the requirements of the Patents Acts, and sufficiently broad to protect the invention in its broadest application.

The author commences with a reasoned argument in favour of patenting as against secret working, and he states it with a lucidity which leaves no doubt as to the folly of relying on secret working. The possibility of successfully keeping a process secret under modern industrial conditions is extremely remote when one considers the probability of leakage of information, wilful or accidental. Further, the process may be discovered by others by analysis of the product, which might reveal traces of the reagents used, or by independent research along the same lines as the original inventor. There are, of course, pitfalls in the patent system, but they can be guarded against, and, with care and expert knowledge, adequate protection of an invention can be secured. The relative position of employer and chemist in respect of an invention made by the latter is discussed in a chapter on patent procedure. This question has often been a matter of dispute, but it is now fairly well established that an invention by a routine chemist outside the ordinary range of his duties should belong to him, but that an invention by a research chemist as a result of his research should belong to his employers.

The question of obtaining the maximum protection for an invention is the subject of another chapter, and is one which requires the most careful study. Infringements are not usually actual copies of the invention, but are either (1) An improvement on the original idea; this becomes probable when the protection has not been sufficiently broad. (2) An alternative process may be attempted, usually by some person who has been working along parallel lines. By carefully drafting the claims, a patent can often be obtained which will cover the alternative solution of the problem in advance, or it may be possible to rely on the "doctrine of equivalents," which means that the courts would hold that a patent covers an *obvious* equivalent to the invention claimed. (3) An evasion of the invention by another process which is not as good, but is still profitable, is sometimes attempted. In such cases the patentee has not taken sufficient trouble to protect inferior modifications of his process.

Accuracy in specifications is treated in another chapter. This is particularly important, though it is sometimes sacrificed to obtain generality. There is no fault which is more fatal to the validity of a patent than inaccuracy or inadequacy of description. This will be understood when it is remembered that a patent is a contract between the Crown and the inventor, by which the latter obtains a monopoly in exchange for *full and accurate* disclosure of his secret.

The validity of a patent is discussed at some length. It may be challenged owing to (1) anticipation by others, which is a comparatively simple ground of objection, or (2) want of subject-matter, which is much less simple. In regard to the latter, it may be said that "a discovery" is not patentable, but the smallest "invention" is patentable if it can be shown to be useful.

The problems briefly indicated above are fully discussed in the book, which closes with chapters containing valuable hints on drawing up specifications and a brief discussion of the peculiarities of patent law in other countries. The book will certainly be an invaluable help to chemists engaged in industrial research work, to directors of chemical firms, and to students of patent law and practice. A subject index is included, as well as an index of the law cases cited in the book. F.

THE PREPARATION OF FINE CHEMICALS: ORGANIC SYNTHESES. An annual publication of satisfactory methods for the preparation of organic chemicals. Vol. I. Edited by R. ADAMS, H. T. CLARKE, J. B. CONANT, and O. KAMM. New York: J. Wiley & Sons. London: Chapman & Hall, Ltd. 1921. Pp. 84. 8s. 6d.

The following statement, which is quoted from the Introduction, will receive a much more sympathetic response in this country than the authors were probably aware of when they wrote it: "The delay in obtaining chemicals, especially from abroad, even if the expense need not be considered, is an important factor. These difficulties have, therefore, thrown the research chemist on his own resources." The object of the volume is, therefore, to offer to the research chemist, by carefully improved or proved methods of preparation, the opportunity of obtaining his own pure materials without too much loss of valuable time. They say quite truly that "the preparation of materials for research, always time-consuming and annoying, is made increasingly so by the inexactness of the published information which so often omits essential details. Because of this, much needless experimentation is necessary in order to obtain the results given in the published reports. As the additional information thus acquired is seldom published, duplication of such experiments occurs again and again—a waste of time and material."

Formerly it was customary to write for special organic chemicals to one of the continental firms, Merck, Kahlbaum, or Poulenc Frères, and to obtain the material of trustworthy purity at a reasonable price within a week of ordering it. *Nous avons changé tout cela.* Every bottle coming from abroad is held up at the Customs House, and, even if the 33 per cent. duty is immediately forthcoming, it may be weeks before the package is delivered at its destination.

Nor is this done in anybody's interest, for few of these special chemicals are made or are likely to be made here, and in many cases where they are catalogued they are not made by the advertising firm, and there is no guarantee of purity. On the contrary, except in the case of a few of the more progressive firms, the chances are that the stuff is too impure to be of any use. The ordinary chemical manufacturer neither likes to make small quantities nor to employ a sufficiently well-trained chemist capable of making them. His genius lies in rule of thumb methods and heavy chemicals. It is the difference between football and billiards, and he prefers football.

The chemist engaged in research at our universities and colleges will, therefore, turn with feelings of deep gratitude to these four distinguished pioneers who appear to have unconsciously realised the difficulties which our Government, with that curious perversity which seems to dog its scientific efforts, has thrown in the way of research and have used their own knowledge and experience and that of many collaborators in attempting to remove them.

The book is carefully compiled, each preparation being repeated and independently checked and the details fully described with all the necessary references. It is also well bound, printed, and illustrated. This is the first instalment of twenty useful preparations, and we are promised an annual addition of about the same number to which chemists everywhere are cordially invited to contribute. We feel confident that the labours of Messrs. Adams, Clarke, Conant, and Kamm will be appreciated by students and teachers of organic chemistry and especially by those engaged in research. J. B. C.

AN INTRODUCTION TO THE PHYSICS AND CHEMISTRY OF COLLOIDS. By EMIL HATSCHEK. Fourth Edition. London: J. & A. Churchill. Pp. xiii., 172. 7s. 6d. net.

It is a treat to read this book, written by one who is a master of his subject and has taken the trouble to write pleasantly and intelligibly. This is one of a series of text-books of chemical research and engineering; it is of a handy size and well printed in good clear type that can be read without fatigue; it has an adequate index and has already reached its fourth edition. The world is in need of many scores of such books, and those who are responsible for bringing them into existence deserve the thanks of the community.

The study of colloids has an increasing interest and importance in biochemistry, mineralogy, and many other departments. The close connection between colloids, emulsions, solutions, and crystals is slowly being explained, and is throwing light on the ultimate structure of the various forms of matter. Mr. Hatschek's book keeps pretty close to its title. It is not, and does not profess to be, a complete account of colloids and their problems, but it gives an account of the physical and chemical principles which are concerned in the topic. Ultra-filtration and ultra-microscopy are explained, and the author deals with viscosity, the Brownian movement, Donnan's drop pipette, syneresis, and so on. There is an excellent account of emulsions and some account of the chemical actions which take place in gels; for instance, the production of metallic crystals from silicic acid gels and the formation of banded precipitates in agar gels, first observed by Liesegang. The book has only one fault. It is too short.

The late Mr. Samuel Weller said that the great art of letter writing was to make the receiver wish there was more. The same may be said of the other varieties of literature. We can recommend everyone who has any interest in learning the principles underlying the building up of matter into its varying forms and states to read this book. The majority will learn something new to them; those who do not will be pleased by the manner in which the subject is presented, and all will regret that Mr. Hatschek's lucid introduction to the study of colloids is so brief. M.

SYNTHETIC TANNINS. By G. GRASSER, Ph.D. Translated by F. G. A. ENNA. London: Crosby Lockwood and Son. Pp. 143. 12s. net.

This handy volume appears at a very opportune time and will be of great value to the leather trades chemist, and especially to those engaged in research, as practically the whole field of investigation in connexion with the chemistry of the tannins is fully dealt with within its pages. Dr. Grasser has brought the whole subject right up to date and includes the researches of Fischer, Nierenstein, Freudenburg and others.

The volume is in two parts, Part I. dealing with the synthesis of vegetable tannins, and also the synthesis of tanning matters and pseudotans. The author also deals with tanning by use of mixtures in conjunction with natural products, and also the modern methods of examining and estimating tanning matters.

Part II. of the volume is, however, probably more interesting, as here the author deals most exhaustively with synthetic tannins, their industrial production and application. He deals with the manufacture of these materials as carried out by the B.A.S.F. works, in which firm the author had considerable experience in the research department. He deals with the first synthetic tanning compound, Nerodol D, and also considers the other products which were subsequently produced by the condensation of the sulphonic acids of the phenols, cresols and hydrocarbons with formaldehyde.

The author gives some information as to the practical application and advantages which these synthetic tans possess over vegetable products. It is difficult to know whether the author has kept back information on this point, as the leather trade in England has progressed very much further in the practical application of these synthetic tans than would appear to be the case in Germany or Austria.

The practical methods described by the author would be considered old-fashioned. The author contrasts the various theories propounded by Nierenstein, Fischer and other workers, and gives complete references to all the papers published on the subject dealt with.

Dr. Grasser has been fortunate in getting Mr. Enna to translate his book. The translation is well done and has not suffered in any way. The author's original views and arguments have been carefully conveyed.

This volume will not only be useful to the chemist engaged in the leather industry, but it is indispensable to the research chemist as a book of reference. J. G. P.

ELEMENTARY CHEMICAL MICROSCOPY. By PROFESSOR EMILE CHAMOT. London: Chapman & Hall. Pp. 479. 25s. net.

The work under review is a second edition; the first edition having been published in 1916. The title "Elementary Chemical Microscopy" is perhaps an understatement of the contents. Although the book is primarily intended as a text-book for students, it nevertheless contains information of considerable value to all engaged in industrial chemistry. This is particularly the case, as courses in chemical microscopy are not commonly included in chemical curricula. The subject-matter is dealt with in a very complete manner, although in the reviewer's opinion rather too much space is occupied in the first four chapters by descriptions of microscopes and their various adjuncts. Most students are familiar with much of this matter, and this criticism applies with added force in the case of technical chemists. The subsequent chapters deal with the ultra-microscope, micrometric methods, quantitative analysis, and the determination of various physical constants, such as refractive indices, melting points, &c. The chapters on qualitative analysis deal with the common anions and cations only. The descriptions of the methods of preparing and handling specimens are very clear and complete. The book is well printed and illustrated, and should prove a useful addition to the library. L. A. L.

THE CHEMISTRY OF SYNTHETIC DRUGS. By PERCY MAY, D.Sc. (Lond.), F.I.C. Third Edition. Revised. London: Longmans, Green, & Co. Pp. 248.

This book is already well known and needs little introducing. In it is described the chemical nature of many of the synthetic chemicals employed in medicine. Its interest, however, goes beyond this, inasmuch as the author draws attention to what is known of the relationship between physiological activity and chemical constitution of the substances described.

This is a very fascinating field of knowledge, in which ten years ago it seemed that great progress would soon be made, but, alas, many of the hastily made generalisations of that day have not received confirmation and extension in the results obtained by recent investigators. Consequently this new edition adds little to our knowledge of the subject, and is but a small improvement in this respect on its predecessors, but the book is such an interesting one and the subject is so well treated that this third edition is sure to be exhausted and yet another called for. No doubt when the time comes for this further edition the author will see fit to make more references to recent work than are contained in the volume under review.

Those unacquainted with the earlier editions of this work should note that it is one of the best books on the subject which have been written in English. F. H. C.

Control of Plants and Processes

Co-operation between Chemist and Engineer

At a joint meeting in London on Friday, January 6, of the Institution of Mechanical Engineers with the Society of Chemical Industry, a paper was submitted by Mr. G. M. Gill, chief engineer to the South Metropolitan Gas Co., on the co-operation of the engineer and chemist in the control of plants and processes. Captain H. Riall Sankey presided, and was supported by Dr. Stephen Miall, Mr. J. A. Reavell (chairman of the Chemical Engineering Group), and others.

The Grading of Coals

In the course of the paper Mr. Gill said that a great need existed to-day for the supply of materials with quality, size and general characteristics much more uniform than was frequently the case with most manufactured commodities. With such variations in raw and other materials used for manufacturing purposes, it was a difficult problem to work plant and processes efficiently, and in such a way as to produce articles of standard quality and quantity. As a result, great loss was caused to the country's trade and industry generally. He proposed to deal specifically with coal and refractory materials, and to outline a system which had been applied with the object of standardizing the quality of gas. The South Metropolitan Gas Co., being a user of coal to the extent of 1¼ million tons per annum, had established a fully equipped laboratory and inspecting staff at Newcastle-on-Tyne for the purpose of examining coals supplied to the company. The coal was sampled as loaded into the company's ships, after which the samples were analysed, and all coal above a definite size hand-picked free from dirt. The results were telegraphed to London in time to give those responsible for the operation of the works an opportunity of regulating the carbonising plant to suit the varying grades of coal before its arrival. This system was still in its infancy, but excellent results were anticipated not only from the point of view of better informed buying, but also of improvement in the cleaning of coals and in the working of plant to suit each consignment of coal. One of the company's stations had already instituted a system of carbonising by which automatic adjustments were made varying with the volatile content in each consignment of coal. In good carbonising from 90-95 per cent. of the volatile content in the coal was converted into gas and liquid products, and as the percentage of volatile matter in the coals used varied from, say, 24 to 34, one class of coal needs very different treatment from another, though it was a factor which had hitherto been neglected in gasworks practice owing to lack of information.

Coal was everywhere bought not by quality but by name, and its price varied with the general reputation of the name, but there was so wide a variation in the quality of each coal that the worst cargoes of a so-called first-class coal were inferior to the best of a second-class coal. He suggested that the time had arrived when each colliery should grade or classify the coals from the various pits and seams, keeping each grade of the same quality within the narrowest practical limits. The advantages of such a step to the users would be very great, and this would react favourably upon the whole coal industry. In the working of a colliery, continuous sampling of the coal as it reached the surface should be the daily and nightly duty of chemists, who would test the coal both physically and chemically, supplying the superintendent in charge with complete records of the quality of the coal, by which system the quality could readily be standardized within limits varying with the consistency of the particular seams. The working of such a system would entail the employment of chemists in the collieries to a much greater extent than was now the case, and this would lead to the production of a better and more uniform quality of coal. While he held no brief for chemists he was strongly of opinion that their presence at the engineer's side was essential to the proper conduct of industries generally, and in the working of collieries there was clearly fine scope for mutual co-operation between the members of the two professions.

Refractories

The variation in size and quality of fire-bricks and blocks and retorts was one of the most unsatisfactory features with which users of refractories had to contend. All kinds of difficult problems had to be faced for want of uniformity. A table was shown of the varying length, width, and thickness of fire-bricks supplied by two makers in this country. Details were given of three pieces of retort picked out from seven pieces chosen at random from a quantity in stock supplied by a well-known manufacturer. The internal dimensions of these pieces should have been 22 in. by 15in. of an oval section. Actually the dimensions in the 20-foot length varied from 22.50 in. to 21.68 in. wide, and from 15.50 in. to 15.31 in. in height. Such variations were typical of material supplied by most of the fire-brick makers in this country, and it was high time that fire-brick makers started to employ rational methods in the control of the ingredients used in brickmaking, and of their mixing, drying and burning. In visiting a fire-brick works, one was usually told that the important work of controlling the kilns was left in the hands of a workman upon whose judgment, without the aid of instruments, depended the degree and uniformity of the temperature and the period over which it is extended. The same was true of the choice and mixing of the raw materials from which the bricks are made. To anyone accustomed to the aid given by chemists and others whose duties consisted of keeping a regular check upon all the factors which contribute to the maintenance of uniformity in the quality of manufactured commodities, it was, of course, obvious that the absence of this absolutely necessary assistance can but result in the defects of which mention has been made.

In the building of any structure of refractory materials it was highly important that the joints between bricks and blocks should be as thin as possible, the bricks being "buttered" only, and consequently it was all-important that the thickness of such bricks should be uniform, as otherwise the bricklayer must either sort over all the bricks to get those of a similar thickness to lay in one course, or he must increase the thickness of the joint wherever the thin bricks are laid. In either case the remedy was very objectionable. Here again there was scope for the chemist to work in conjunction with the engineer or manufacturer. It was necessary, in the conduct of fire-brick works, to institute methods providing for: (1) The continuous sampling and analyses of mixtures in use, both chemical and physical; (2) the use of heat recorders in kilns; (3) definite limiting standards for size and shape; (4) guaranteed working to specifications.

It might be argued that the extra cost of applying such methods would not be forthcoming from the sale of the materials made, or, in other words, that the bricks would be too expensive to sell. The control proposed would doubtless result in the production of a higher and more consistent quality of brick; this would increase sales and consequently lower overhead charges in the works. The control would further diminish rejected bricks, save fuel costs in kilns, increase capacity of plant and effect improvements which would result from increased knowledge of the process. At present the most enlightened refractory users were searching the country for a better quality of materials, which was of far greater importance than that of price, important though that be.

Control of Plant for Standard Gas

The South Metropolitan Gas Co. had applied scientific control both to the working of the manufacturing plant and to the maintenance of the quality of the gas supplied. The company had seventeen retort houses, the average size of which contained 246 retorts, each of which carbonised 25 cwt. of coal per twenty-four hours. Sixteen retorts were heated by one producer consuming 3.7 tons coke per twenty-four hours. If coal and coke were priced at 30s. per ton it would be seen that the average retort house was dealing per twenty-four hours with raw material valued at £546. If the other expenditure entailed in working a retort house was added, such as labour, upkeep, and power, a further £168 must be added to this figure, making a total of £714 a day. A fairly complete system of control by means of chemists and testers could be provided at an additional cost of £3 8s. per twenty-four hours. Did it not appear obvious that this expenditure—0.5 per cent. of the whole amount involved—was likely to be recouped many times over as a result of the more intelligent working of the plant?

The South Metropolitan Gas Co. had adopted a policy of supplying a standard quality of gas, this being 550 B.Th.U. per cub. ft. With a view to maintaining the standard and to reducing variations in quality to a minimum, a typical system in use at one of the manufacturing stations might be described. The gas being made was collected at a uniform rate in a small test gas-holder for each hour throughout the day and night. It was then tested every hour for calorific power, the result being immediately telephoned to the official in charge of the manufacturing operations. In addition, the gas being

made was tested midway between the commencement and completion of each hourly sample. This was a check on the other test, the two figures giving the official at intervals of half an hour the quality of the gas being made. Finally, the holder in which the gas made over a period had been mixed was used to supply the company's district, situated at six different points upon which are London County Council Testing Stations, where independent examiners test the gas several times daily. The average of all such daily tests constituted the official figure of the quality of gas supplied each day.

Discussion

THE CHAIRMAN said that this was the third of the joint meetings between the Institution of Mechanical Engineers and the Society of Chemical Industry, and he hoped there would be more of them as time went on, because he regarded them as of great importance.

DR. STEPHEN MIALL said it gave him very great pleasure, as a member of the Society of Chemical Industry, to be present and hear this interesting paper, and to have the opportunity of expressing the thanks of the Society in being allowed to join with the Institution of Mechanical Engineers in these meetings.

DR. W. R. ORMANDY said the author had complained that the colliery owner did not employ chemists. Was it likely that the colliery owner was going to employ chemists so long as he could continue selling roofing shale at about £3 a ton? Now that we had to pay enhanced prices for fuel it was eminently desirable that some system should be devised whereby coal was bought on the basis of the heat units contained in it. With regard to fire-bricks, the difficulty was that the English maker dug his material out of the earth, as his father and grandfather did; he pushed it through a machine, and pugged it, and worked it into bricks, by putting it into a kiln which was hot on one side and comparatively hot on the other, and then he said, "There is the brick: take it or leave it." In France they had realised that it paid to pay 80 per cent. more for a fire-brick which was correct and regular in shape. He had once gone into the question in regard to certain metallurgical operations of what they could afford to pay for fire-bricks of regular size and composition, and it was found that, instead of paying £4 a thousand for the bricks, the length of the life was so increased by getting the regular quality and size that it was an economical proposition to pay £40 a thousand. France had discovered that it was possible to make bricks which had no contraction. The present condition of things was not due to the chemist, who long enough had been pointing out what ought to be done, but the colliery-owner and the middle-man had no desire that these things should be done.

PROFESSOR J. W. HINCHLEY thought the author had proved the necessity for the existence of the chemical engineer, not only in the gas and fire-brick industries, but in other industries. The position of the chemical engineer in industry to-day was an extremely difficult one, but he was necessary if industry was going to obtain exactly what it wanted. If we demanded a brick, for instance, which did not contract more than $\frac{1}{16}$th in. in length, and one which must have a certain depth and breadth, we should get it if we insisted, but as long as we were content to accept a second-class thing we could go on accepting it. The chemical industry in this country owed a good deal of its progress before the war to the manufacture of chemical plant in Germany, simply because there they devoted themselves to chemical engineering problems, and turned out stoneware and plant which did its work, whereas in this country we found the same dearth of chemical engineering as we found before the war, and manufacturers were going back to their old methods. In his opinion, the commercial man was a great deal to blame, because he engaged a man to buy, for instance, fire-bricks, who knew nothing whatever about fire-bricks. There were heaps of people in our factories to-day who were buying materials without any knowledge whatever of them, and the result was that the people who had to use these materials were hampered. No doubt Mr. Gill had a voice in the purchase of his fire-bricks, but there were large numbers of engineers in our works who had no voice whatever in the purchase of materials. It was usually found that some fellow in the office said he could get the bricks, for example, at 5s. a thousand cheaper, and he proceeded to buy some rubbish at 5s. a thousand cheaper. Commercial men were needed with some knowledge of the industry in which they worked. By all means let them pay more for their materials, because they would find eventually that the more accurate they made a thing, the cheaper it was generally to make.

MR. J. A. REAVELL (Chairman of the Chemical Engineering Group of the Society of Chemical Industry) expressed the opinion that many of our industries to-day are suffering because we did not recognise the absolute necessity for co-operation between the engineer and the chemist. It was not a question of the chemist *versus* the engineer, or *vice versâ*. They must admit that everything in manufacture must come down to engineering; that was the bed-rock of civilisation. The chemist must work with the engineer, and the co-operation that was needed was that of a chemical engineer who knew the thoughts of the one and could translate them into the actions of the other. The question as to whether the seller should have a chemist, or the buyer should have a chemist, seemed to be beside the point. They had heard from the author about the buying of coal, and he sympathised with one of the speakers, who said that if the buyer was fool enough to buy dirt instead of coal, then it was certainly his own look-out. Personally, he thought that both the buyer and the seller should have a chemist, and then the chemical engineer would be the man to work out the different points and get the problem into its proper light. A little while ago he had to examine some tenders for evaporation plant, in which there was a great variation in price. The chemist wanted a certain plant, and the buyer, who was a buyer such as had been described by a previous speaker, who knew nothing whatever about it, wanted the cheapest article. The chemist knew exactly what he wanted, as far as the chemical work was concerned, but as far as the mechanical work was concerned he knew nothing about it at all. On looking over these tenders, he (Mr. Reavell) found that the buyer was going to place an order for plant at a very low price, but he had to point out to him that the seller was offering him a plant to do certain evaporations, and he had based his price on using the expression "from and at." The seller had not taken the temperature of the cold liquor, but the liquor with a very high boiling point, and it had never seemed to have occurred, even to the chemist, that somebody had got to heat 14 tons of liquor an hour up to boiling point before it went into the apparatus, and it was that which accounted for the enormous difference in price. "From and at" did not mean anything to anybody. The mechanical engineer knew what it meant, so far as boiler tests were concerned, and here was a case in which there was no competition between the chemist and the engineer, but the absolute necessity for co-operation between the two. Another good illustration as to the necessity for co-operation between the chemist and the engineer was in the buying of tubes for use in chemical works. Take the very common use of tubes in connexion with caustic soda. They could go to any of the standard tube makers and say they wanted solid-drawn tubes for use in caustic soda boiling. The manufacturers showed them a tube, and said it was so much a foot; but when he was asked as to whether it would stand the boiling of caustic soda of such-and-such twaddle, he said he did not know. His answer usually was that the purchaser wanted the tube, and not the seller, and that as seller he was perfectly willing to sell as many thousand feet as was required. They could not, however, afford to pay £2,000 for tubes in order to find out whether John Smith's tube was of no use for caustic soda. As a contrast to our methods, he had recently been offered from the Continent some material, and a very intelligent letter had been written, saying that caustic soda of such-and-such a density, and of such-and-such a boiling point, required a certain tube. What was the result? It was that the order went to the man who provided the goods, and there was no need to worry about the price because they were getting the goods they wanted. That was what they would do every time, and that was really where co-operation between the chemist and the engineer came in. They wanted a chemist on both sides, and then co-operation between the chemist and the engineer, so that the man who was selling knew what he was selling, and the man who was buying knew what he was buying. Only in that way would this country get a chance. We had all the brains in this country, and all the knowledge, but we were fools in the way we applied it.

MR. E. A. ALLIOTT expressed his disappointment that the author had not gone more fully into the question of co-operation between the chemist and the engineer. Of course, in an ideal world they would have a chemical engineer who knew everything about engineering and chemistry and then there would be no need for co-operation. Unfortunately, at the present time, in this imperfect world, that mythological beast did not exist. The first step in co-operation was in designing. They would have to set down

first of all the conditions to be fulfilled in treating any particular chemical or chemical material, and questions of temperature, pressure, corrosion, &c., would have to be discussed. There the chemist could help the engineer by advising him of the small variations in the material, and their effect, impurities, and so forth. Then there was the question of the material, of which the chemical plant was to be built. There the chemist could come in with his knowledge of corrosion factors, and so forth, and help the engineer very considerably. Finally, there was the size, shape and strength of the plant, which was very largely a pure engineering problem. Here again, however, the chemist could help, with his knowledge of certain factors, such as the important one of the transmission of heat through heating surfaces. Then came the position when the plant was in operation. The importance of chemical knowledge then became more and more emphasised. Take the question of filtration. They might put in a filter press or a centrifuge to do certain filtering operations. There was not much that the engineer could do in that connexion, except to vary the speeds or pressure, but the chemist, and the engineer who understood what chemistry involved—the chemical engineer—would understand that the best output could not be obtained from that plant unless the material came to it in the right state. For instance, one might have some material which at one time was comparatively crystalline, and at another time highly gelatinous, and that would affect the output of the plant possibly detrimentally. There was nothing that the engineer could do to help that, and it was the chemist who must come in for this part of the process. The engineer required to have sufficient chemical knowledge to realise this, and to look to the chemist to help him, and conversely, the chemist should realise that it was up to him to help the engineer to get the output out of the plant. Coming to the question of evaporation again, an engineer could build an evaporator to do a certain job; take for instance the question of handling soap lyes. The engineer could build a plant of suitable dimensions, to give a certain output, if it were reasonably worked, but he could not get that output with any reasonable size of plant unless the chemist came in and looked after things a bit. For instance, the chemist had to watch that there was not too much organic matter in the soap lyes, or it became too thick in the final operation, and the capacity would be cut down. Then there was the question of inorganic salts. If there were too much of certain constituents, the salt that came down would not filter properly, and they would not be able to get the salt away sufficiently dry, or sufficiently quickly, from the salt box of the evaporator. Again, if the chemist allowed grease to come in, the capacity of his evaporator would be very much cut down. Occasionally they came across a buyer with less common sense than usual, and he might ask them to guarantee the plant. The counter to that was to ask him to guarantee his material, but he was not anxious to do that. They would, however, realise, from what he had said, that there was a certain importance about that. In designing plants they had got to assume that the sample of the material which had to be treated was better than the bulk of the material would be, and in that case the only course to adopt was to design the plant of a larger size than would be necessary if they could be assured that the bulk of the material was up to sample. As a matter of fact, that was what was usually done, but it was not an economical proposition to build plants which were too large for their purpose. The other alternative was to take the sample as it stood, and design the plant accordingly, but then they ran the very big risk of getting a plant which would not give the required output. Thus, there was evidence of the real need for co-operation between the engineering side and the chemical side, in order that plant might be designed on economical lines, and the costs of operation and maintenance reduced to such a level as to enable us to compete with people elsewhere.

Captain Sankey, at the conclusion of the discussion, asked if it were the opinion of the meeting that the British Standards Association should be asked to appoint a committee to deal with the standardisation of dimensions of fire-bricks, and the errors permissible in these dimensions.

Professor J. W. Hinchley.—I happen to be chairman of that committee.

Captain Sankey said he had specially asked whether there was such a committee, and had been told there was none. He hoped, however, that the committee would be successful in standardising these dimensions, which would be one step towards industry getting proper fire-bricks.

Flash-point Temperatures of Oils

Their Physico-Chemical Significance

At a meeting of the Institution of Petroleum Technologists held on Tuesday at the rooms of the Royal Society of Arts, London, Professor J. S. S. Brame presiding, a paper entitled "An Investigation into the Physico-Chemical Significance of Flash-Point Temperatures," by Dr. W. R. Ormandy and Mr. E. C. Craven, was read by Dr. Ormandy.

The lecturer pointed out that a knowledge of the flash-point and of the vapour pressure, especially in the case of pure bodies, suffices to give the composition of the vapours at the limits of flame propagation. In this connexion the authors were of the opinion that flash-points and the deductions to be made therefrom were of considerable interest both from the theoretical and practical points of view. He then described determinations of the flash-points of a number of the organic bodies which they had carried out with a Pensky-Marten tester in the usual manner. They found, as a result, that there appeared to be an approximately linear relation between the flash and boiling points which might roughly be expressed in the form:

$$\text{Flash-point } ^\circ\text{K} \times \text{constant} = \text{Boiling-point } ^\circ\text{K}$$

The question of flash-points was taken up again in connexion with work on the alcohol solubility of hydrocarbons being carried out for the Distillers Co., Ltd., and as this work was being carried out down to low temperatures it was thought desirable to devise apparatus suitable for use at temperatures over any desired range. In considering this question it appeared to the authors that the usual types of flash-point instruments possessed several grave defects which militated against their being regarded as of true scientific design. These defects were: (1) The vapour space was unevenly heated, the top surface being exposed to cooling by the air; (2) Loss of vapour was liable to occur when the test flame was introduced through open ports in the lid; and (3) the instrument could only be used for lower flash-points. Other objections on the score of convenience also influenced them, such as the large bulk of liquid required and the awkward nature of the tester if it were required to be used at reduced or increased pressure. The apparatus, which was shown, consists of a bell-shaped glass tube supported by a shive in an 8 in. by 1 in. test tube. A thermometer, backed with thin tinfoil, passes down through the bell-tube, making connexion with the high tension terminal of a magneto and with a spark-gap arrangement. The spark-gap consists of two concentric cylinders of copper foil to which are soldered 1 mm. nickel-wire points. The two cylinders are insulated by a short piece of glass tubing. Before making a test the bell is lined with a rectangular piece of filter paper, leaving a $\frac{1}{4}$-in. clear strip through which to observe the spark. Results obtained by means of various types of apparatus were shown. Experiments were also made to determine if the flash-point was affected by the number of sparks used. A Mexican kerosene having a normal flash of 31°C. was heated at 4°C. below this temperature. Twenty sparks were passed, and the flash-point was then found to be 31°C. after four more sparks (one test each 1°C.). In a similar manner, forty sparks raised the observed flash 1°C. Heating the kerosene at 2°C. below its flash-point, twenty sparks showed a rise of 1°C. and forty sparks, 2°C.

Types of Apparatus Compared

The difference between the results obtained with the new apparatus and the Abel or Pensky-Marten type of tester was attributed in part to the fact that the ratio of the vapour space above the liquid to the volume of the latter was much smaller in the case of the standard instruments. In the Abel tester the ratio was about 70 liquid to 30 vapour, whilst in the new tester it was more of the inverse order. Thus more liquid had to be vaporised in order to give an explosive mixture, and in the case of a complex mixture this corresponded to an increased temperature. It followed from this that pure liquids should not show this difference and, in fact, the difference in the case of nearly pure bodies was very much smaller. The new apparatus was much less sensitive to very small quantities of volatile bodies.

Describing the method of using the new instrument at low temperatures, the lecturer said that after assembling, a dry piece of filter paper is placed in the bell, and 7 cc. of the liquid to be tested is run into the tube. Liquid SO_2 is then run into the outer tube and distilled away in the vacuum of a water pump. The liquid is cooled well below the anticipated flash-point, and the vacuum then reduced or cut off so that the temperature, after a time, commences to rise at the rate of

some 1°C. per minute. At each degree rise a spark is passed. The liquid may be stirred gently by raising and lowering the bell-tube or by shaking the whole apparatus round. At the flash-point a mild explosion occurs, usually accompanied by a flash of pale blue flame, although in the case of alcohol the flash is practically non-luminous.

No determinations had been made at temperatures higher than could be reached with a water bath. For these determinations the tube is immersed to a depth of 4 in. to 5 in. in a beaker of air-free water, which is heated by a tiny flame, so a difference of about 2°C. is maintained between the bath and the vapour space. This corresponds to a rate of temperature increment of some 1°C. per minute.

Boiling-point Range

The question of boiling-point range, said Dr. Ormandy, was closely bound up with the differences in the observed flash-points with various types of instruments. In the case of pure liquids, where the range should be nil, the same results should be obtained whatever the ratio of the vapour space to the liquid volume. When, however, the liquid had a steep distillation curve great differences might be noted; this had the effect of raising the constant R as determined by the new apparatus. An interesting example was cited in the case of "tetraline."

Making allowance for disturbing factors, the authors found that the flash-point of any hydrocarbon was a linear function of its boiling-point. They submitted as a result of the present research that for any hydrocarbon or any mixture of hydrocarbons, not containing small quantities of volatile impurities, in contact with air, the limiting temperatures at which explosive mixtures were formed were constant fractions of the initial boiling-point.

Results were shown in tabular form of determinations of flash-points under varying pressure with kerosene and on ethyl alcohol and water; alcohol-benzene-kerosene mixture with ether, &c. After referring to Ramsay and Young's law relating to vapour pressure relations of liquids, and data from the work of Young, Ramsay and others, the authors found that at the flash-point all hydrocarbons possessed approximately the same vapour tension.

A number of tables and lantern slides were shown, and in conclusion Dr. Ormandy stated that the ground covered by the paper was a portion of an extended investigation which was being carried out on the physical properties of pure and mixed fuels for the Distillers Co., Ltd., and the Fuel Research Board of the Department of Scientific and Industrial Research.

A short but interesting discussion ensued, in which Professor Brame, Mr. E. C. Craven, Mr. H. Moore, Dr. Lessing, and Dr. Thole took part.

The Concentration of Liquors

Modern Evaporation Methods

In a paper on "Modern Methods of Evaporation for the Concentration and Recovery of Liquors," delivered at a recent meeting of the Aberdeen Branch of the Technical Section of the Paper Makers' Association of Great Britain and Ireland, Mr. James Holmes pointed out that the evaporator was, or should be, a machine for the utilisation of heat in its most economical way, and it must be considered without any reference to limitations of steam pressure or of steam withdrawal. The lessons of the Carnot and Rankine cycles were that the greatest efficiency was possible when the working substance was taken in at the highest possible temperature and rejected at the lowest. This corresponded with the highest possible steam-pressure supply and the highest possible vacuum. An evaporator should consist of an infinite number of apparatus in series, working between upper and lower temperature limits. It could not be said that the Rankine diagram, as illustrated by the temperature entropy chart, was correct in its application, as in vacuum evaporation there was no adiabatic expansion taking place in which external work was done. In its place, however, there was a passage of constant total heat to the feed liquor, on the assumption that there was no rejection of heat. They were not concerned with the heat put into feed water, because it was not available for the evaporative work, as the temperature of rejection of drainage was the same, or nearly the same, as that of the vapour.

The well-known temperature entropy curve as drawn for 1 lb. of water showed the whole rectangular area to be the available heat supplied to the evaporator at temperature T. By reason of temperature drop, it followed that it might be possible to pass on the whole quantity of heat at some lower temperature T_2, the exchange being entirely due to the temperature drop.

Superheating during Compression

For economical work other possibilities should not be overlooked in study of the vacuum evaporator only. A certain amount of superheating occurred in the compressing, but this was almost exactly annulled by the wetness due to expansion of the supply, so that the evil effects of supplying superheated steam for condensation hardly existed. In this connexion Mr. Holmes pointed out that with most liquors the vacuum evaporator was not free from superheating, and in many cases increased output was available by removing the superheat before allowing such vapours to come into contact with the working surface.

The losses of heat in evaporation comprised: (1) Radiation losses; (2) losses by excess temperature and escape of condensable vapours in drainage; (3) losses by liquor discharge; and (4) losses by rejection of heat to condenser. Of these, item (1) could be reduced to a small fraction of the whole by good insulation. In item (2), where the excess heat carried off was in the form of sensible heat, the loss was slight, and if it was to be recovered it was better done outside the evaporator, as water could not be drained off the tubes too quickly to maintain good rapid boiling. In some plants the drainage was simply passed and controlled by a valve to some point at lower pressure. Item (3) was in general a very small fraction of the whole. Item (4), the heat accepted by the condenser was a very large quantity—in the vicinity of 1,000 B.Th.U.'s per lb. The necessary high vacuum could only be obtained by this means, but the real secret, if there was one at all in economical concentration, was to reduce this quantity by every possible means.

Improvements in Design

Dealing with the question of design, the lecturer pointed out that steam and vapour openings and pipes were often too small. If circulation was defective, bigger temperature drops became necessary, particularly where the liquor was deep. Conductance depended to a large extent on the velocity of the circulation. Defective drainage was frequent, and the cause of low output in many cases. Water, he said, was a bad conductor, and therefore could not be removed too quickly after its formation, even though the sensible heat it contained might be lost. Non-condensable gases and air were also sources of trouble. Their presence at the heating surface not only tended to prevent passage of heat, but caused the complete upsetting of all of the natural conditions of temperature drop which one reckoned upon.

Scaling-up was described by Mr. Holmes as the bugbear of all heat-transmission problems; it could only be overcome by very frequent cleaning.

Multiple Effect Evaporation

The best known system of evaporation in multiple effect in this country seemed to be the vertical short-tube type. The essence of the whole problem of design reduced itself into meeting the following conditions: effective boiling with low-temperature differences; rapid removal of condensed steam and non-condensable gases; vigorous circulation; and prevention of rejection of heat, principally in its latent form. Papermakers' liquor was apparently most successfully handled by triple or quadruple effects, but some heavy liquors of high boiling temperature, such as glycerine containing salt, could not be handled satisfactorily in anything higher than double effect.

As illustrating the scope of the subject of evaporation, the lecturer said the total quantity of liquor handled weekly in Great Britain in vacuum evaporators was probably about 75,000 tons, and the capacity of plant in existence was certainly well over this figure. The requirements of various trades were included in these figures—namely, papermaking, mercerising, soda manufacture, salt manufacture, soap-making, glue and gelatine, tanning extracts, sulphate of ammonia, sugar, and many others. A great deal of attention was therefore due to a subject the practical results of which were of such magnitude. Concentration was an important feature of most branches of industrial activity; the demand for it was steadily increasing, and with the increased requirements came the demand for more and more economical working.

"Bio-Chemical Method"

Paper by Professor Arthur Harden

A JOINT meeting of the Manchester Section of the Society of Chemical Industry, the Institute of Chemistry, the Manchester Section of the Society of Dyers and Colourists, and the Manchester Literary and Philosophical Society was held on Friday, January 6. Dr. Ardern presided, and there was an attendance of over 200.

Mr. L. G. Radcliffe read a communication from Dr. J. P. Longstaff, general secretary of the Society of Chemical Industry, expressing the hope that the Manchester Section, as well as others, would see its way to forming a committee for the purpose of considering the feasibility of adopting a more accurate nomenclature for chemical products in general. The need for such consideration of the matter had been quite recently emphasised by proceedings before the Official Referee under the Safeguarding of Industries Act.

Professor Arthur Harden (of the Lister Institute of Preventive Medicine) read a paper on "Bio-Chemical Method." He said the term "Bio-Chemistry" was used to express the science of chemistry in relation to life. The materials of which animals and plants were composed were no more peculiar to bio-chemistry than to organic chemistry, and as a matter of fact the insight which had been gained into the nature of those materials was largely due to pure organic chemical research. The same might be said with regard to the conditions which ruled in respect to living organisms. When, however, the changes which occurred in living organisms were considered the position was somewhat different. Temperature was an important factor, and, the reagents, or so called enzymes, which caused the reactions had not yet been isolated. In biological changes the enzymes were always accompanied by other substances, and if there was a change in the concentration of the enzymes the concentration of the other substances was also changed, and there was no means of telling to what the resultant effect was due. For example, if an investigation was being made of the action of saliva, and it was desired to ascertain the effect of dilution, the dilution not only affected the enzyme but the salt which accompanied it, which was necessary to its action, so that there was an alteration of two actions instead of one. This kind of difficulty pervaded the whole work in connexion with enzymes. Interest in vitamins largely arose in connexion with experiments regarding purified foodstuffs. Investigators started working with animals and trying to deprive an animal of one particular constituent of its diet, with the result that they fell into the error of removing more than they thought they had.

Hopkins' experiments on rats with a diet of purified casein, lard, starch, and salts were then explained by Professor Harden. On this diet rats eventually died, whereas when 3 c.c. of milk was added they continued to grow at an ordinary rate. Hopkins came definitely to the conclusion that there was some other substance necessary for the growth of the animals which was unknown. Experiments with guinea pigs and monkeys were also described. The marked effect of the lack of butter, during the war period, upon the children of Denmark was also indicated, and as the result of which the Danish Government prohibited its exportation.

Modern methods of milling and polishing rice, by which the germ and the pericarp were removed, had had the effect upon people in the East, who had been accustomed to eating rice simply pounded into flour, of causing beri-beri, owing to the lack of the anti-neuritic vitamin. In the case of animals it brought about a peculiar paralysis of the peripheral nerves. The least introduction of the required vitamin brought about quite a dramatic cure; for instance, in an hour or two a bird would be walking about its cage picking up food whereas previously it was quite helpless. The anti-scorbutic vitamins were then discussed.

The probability was that vitamins were not simple substances, but were substances of fairly high molecular weight, and there was little doubt that they were produced by plants.

A discussion followed in which Messrs. Ardern, Armstrong, Thomson, Dearden, Walmsley, Kingsley, and many visitors took part, and to which Professor Harden replied.

Further Experiments with Activated Sludge

AT a meeting of the London Section of the Society of Chemical Industry, to be held at Burlington House, London on January 16, a paper on "Further Experimeuts with Activated Sludge," by E. H. Richards and G. C. Sawyer, will be read.

Safeguarding of Industries Act

The Importation of Gold Leaf

AN inquiry was opened on Monday, at 5, Old Palace Yard, London, by a Committee appointed by the Board of Trade, under Part II. of the Safeguarding of Industries Act, into a complaint that gold leaf is being imported into the United Kingdom from Germany at a price which, owing to the state of the exchange, is having a detrimental effect upon the industry in this country, and seriously affecting employment. The Committee consists of Dr. J. H. Clapham (Chairman), Mr. F. J. Blackmore, Mr. J. T. Brownlie, Mr. J. W. Murray, and Mr. Owen Parker. The complaint is put forward on behalf of the British Master Gold and Silver Beaters Federation, The Gold Beaters Trade Society, and the Women's Gold Leaf Workers Society. The complainants stated that British manufacturers could, except against Germany, hold their own at competitive prices. German gold leaf, 3⅜ in., was being sold here at £2 12s. 6d. per thousand sheets, at which price it was impossible for any British manufacturer to produce it. With wages at their present figure, it was estimated that 3⅜ in. gold leaf could be manufactured in the United Kingdom, and sold at £3 16s. per thousand sheets.

Mr. MacKenzie Wood, M.P., representing the Gold Leaf Group of the London Chamber of Commerce, which is opposing, submitted that there was no case for the complainants. Whilst he appreciated that the trade was hard hit, it had been said that the Germans had the advantage owing to climatic conditions chiefly, and he submitted that a *prima facie* case had not been made out. He asked the Committee to say that it was unnecessary to hear the case for the opposition.

The Chairman announced that the Committee would hear the case for the other side and that the inquiry would be resumed on January 24.

Safeguarding British Glassware

Committee adjourns until January 16

THE committee which is inquiring into the application, under Part II. of the Safeguarding of Industries Act, for the imposition of a duty on domestic, illuminating and mounting glassware imported into this country from Germany and Czecho-Slovakia, resumed its sittings on Tuesday, Sir William Ashley presiding. On behalf of the Birmingham Jewellers' and Silversmiths' Association it was stated that the Association opposed the application to impose a duty on mounting glassware because British glass manufacturers had never made the goods, and could not to-day make them at competitive prices. It was practically impossible at the present time, under present conditions, to make glass successfully in moulds, as blowers in this country were not sufficiently experienced. The Association would be pleased to withdraw its opposition if it could be proved that the articles could be produced here.

After an examination of witnesses *in camera*, the sitting was adjourned until Wednesday.

At the resumed hearing on Wednesday Sir Arthur Colefax summed up the case against the claim that a duty should be imposed. Except for trifling exceptions, he said, the mounting glassware required never had been made here. As regards the illuminating glassware, the Committee must be satisfied that the prices at which these articles were being sold here to-day were occasioned by the fall in the currency of the country from which they came. The ratio of increase over pre-war price of imported articles was substantially higher than the ratio of increase in the case of pre-war British goods.

Mr. C. Wilson, giving evidence in favour of the proposed duty, said the fundamental cause of unemployment in the electric bulb trade was the very low price at which German bulbs were put on the English market. He believed that relief under the terms of the Act would tend to increase employment among English bulb blowers.

The Committee, which sat until a late hour, adjourned until January 16.

Washington Decision on Chemical Warfare

ON January 7 the Washington Conference on Disarmament continued the discussion on the use of Poison Gas in Warfare, and the Naval Limitation Committee agreed to a resolution prohibiting the use of gas entirely. Mr. Balfour said no nation could forgo the duty of examining how such attacks could effectively be met, while General Fries, who is in charge of the American poison-gas works at Edgewood, maintained that the closing of these works would be the biggest mistake of the Conference, as gas was America's most valuable defence.

Institution of Chemical Engineers

Draft Constitution Discussed

THE second meeting of the Provisional Committee of the proposed Institution of Chemical Engineers was held on Wednesday, December 21 last. There were present: Sir Arthur Duckham, K.C.B. (chairman), Dr. E. W. Smith, Messrs. W. J. U. Woolcock, M.P. (vice-chairman), J. Arthur Reavell, M.I.M.E., W. Macnab, F. A. Greene, S. G. M. Ure, H. Talbot, D. M. Hewitt, F. H. Rogers, M.I.M.E. (hon. treasurer), Dr. Brownlie, Professor J. W. Hinchley (hon. secretary), and the acting-secretary, Mr. A. C. Flint.

In opening the proceedings, Sir Arthur Duckham made it clear that he was in the movement not merely for the purpose of forming an Institution, but for the education and production of men competent to handle our chemical industries. Several letters were received containing suggestions for the constitution of the Institution. Mr. D. Brownlie and Dr. Smith made statements with reference to earlier attempts to form a similar Institution, and Mr. G. K. Davies attended to give an account of the movement which was associated with his father. It was agreed that in the first instance the Institution should be founded as a limited liability company, with permission from the Board of Trade to omit the word "limited," but that a charter should be applied for as soon as it became clear that its attainment was possible. A draft of the constitution was submitted and discussed, and it was agreed that in its amended form it should be circulated among the members, and that the chairman should invite an experienced solicitor to attend at the next meeting for its discussion. On the question of funds, it was agreed that further subscriptions would be desirable, and that the matter be left to the discretion of the hon. secretary and hon. treasurer. It was agreed that the committee should meet again on Wednesday, January 18.

Mann and Cook (West Africa), Ltd.

Voluntary Liquidation Confirmed

AN extraordinary general meeting of Mann & Cook (West Africa), Ltd., was held at Cannon Street Hotel, London, on January 6, to pass resolutions to wind up the company (*see* THE CHEMICAL AGE, Vol. V., pp. 671 and 841).

Sir Richard Cooper, who presided, said it was decided at the meeting held on December 22 that the company should be wound up voluntarily, and this meeting was held to formally confirm that decision and appoint a liquidator. They had already dealt at great length at previous meetings with the difficulties which had brought the company into its present position, and he thought there was no useful purpose to serve in going over it again. He moved that the company should be wound up. Sir Alfred Sharpe seconded the resolution. Several shareholders expressed the view that they ought to have more information as to the transactions of the company. They wished to hear a statement from Mr. William Mann, who was present at the meeting. The Chairman pointed out the difficulty of re-discussing these points, and, after further remarks from shareholders, Mr. Mann said he was quite willing to answer any questions and give information. On the suggestion of the Chairman, it was arranged that Mr. Mann should remain behind after the termination of the proceedings to meet the shareholders informally. Mr. D'Arcy Cooper, of the firm of Cooper Brothers & Co., was appointed liquidator.

Operation of the Fourcault Glass Process

SPEAKING at the second ordinary general meeting of the British Window Glass Co., Ltd., held in London on January 6, Sir Walrond Sinclair, who presided, said that the efforts made to provide the additional capital required to complete the works had now met with success. Referring to the operation of the Fourcault process abroad, Sir W. Sinclair said that in Belgium, where the parent works were, a successful year had just been terminated, and the output had been nearly doubled by increasing the size of the furnaces. Plants had been erected in Czecho-Slovakia, and one in Holland, all of which were working very satisfactorily. The company owning the foreign rights had recently sold the American rights for a very considerable sum.

Coal from Waste

An Experimental Industry at Ashington

IT is reported that plant for the extraction of usable coal from colliery waste has been temporarily set up at Ashington on behalf of Minerals Separation, Ltd., of London, whose northern agents are the Skinningrove Iron Company, Ltd., Saltburn, Yorks. It is claimed that this plant is capable of treating 75 to 100 tons per day, and is intended to determine the results to be obtained under commercial conditions. Similar machinery is being erected in several mining centres.

The process is to collect the waste—brasses and duft—crush it, and mix it with water and a small quantity of oil requisite for flotation. The agitation produces a heavy froth containing all the recoverable coal, which is mechanically removed. The shales, "brasses," and other foreign matter remain in the water, and are run to waste. The bulk of the water is then removed from this coal-bearing froth, and the coal itself dried. It is claimed that the process on completion gives an excellent coal for coking purposes, being remarkably free from ash; it is also useful for making briquettes.

Hull Chemical and Engineering Society

MR. J. PRYCE JONES, B.Sc., A.I.C., addressed a good assembly of the members at the Wilberforce Café on Tuesday evening, Mr. A. R. Tankard, F.I.C., presiding. The subject of the lecture was "Some Applications of Physical Chemistry to Industry."

Mr. Jones introduced a highly intellectual discourse by showing how physical chemistry had assisted in the advancement of chemical knowledge from the purely descriptive and empirical to the rational and quantitative state. A few of the fundamental principles of physical chemistry, such as the Concept of Equilibrium, the Law of Mass Action, the Principle of Le-Chatelier and the Vant Hoff Reaction Isochene were then discussed, and from these the lecturer passed on to a brief description of the Electrolytic Dissociation theory, Catalysis and Colloids and Colloidal Electrolytes. These principles were illustrated by copious examples from industry such as the equilibrium mixtures in the Deacon Chlorin, process and the yields from the Reaction $N_2+O_2 \rightleftarrows 2NOe$ at various temperatures.

A full account was given of the Claude ammonia process, and the influence of pressure and temperature was discussed at length, also the optimum conditions for the formation of sulphur trioxide in the "Chamber" and "Contact" processes for manufacturing sulphuric acid were investigated.

References were made to the importance of catalysis in industry, and graphs were shown (1) of the effect of the "previous history" of the catalyst upon the rate of absorption of hydrogen by unsaturated acids and glycerides, (2) of the effect of the presence of gaseous poisons upon the efficiency of the catalyst. The conditions which determine the solubility of salts in solutions were analysed, and the lecturer showed how these could be applied in industry. A brief account was given of the characteristic properties of colloids and descriptions were given of the aluminium current rectifier, de-emulsification of water and some applications of electroendosmose.

The president proposed a vote of thanks to the lecturer, which was seconded by Mr. J. E. Worsdale, B.Sc., and heartily carried.

Transparent Rubber and Rubber Glass

ONE of the features of an Industrial Exhibition which was opened on Monday in the Orchard Street building of Selfridges, Ltd., London, was a stand containing exhibits of rubber manufacturers, &c., arranged by Mr. Fordyce Jones. Typke & King, Ltd., had a display of rubber compounding ingredients, chemicals, and fillers used in the rubber industry, while the Peachey Process Co., Ltd., exhibited a variety of rubber products made by their process, including vulcanised gels and other sundries. The exhibit of James Lyne Hancock, Ltd., included Hancock's original machinery, including a mill, calender and masticator, over 100 years old. The Reliance Rubber Co., Ltd., exhibited various articles of manufactured rubber, while Oswald Latham & Co. had a display of raw Amazon and plantation rubbers. Mr. Fordyce Jones presented the first laboratory samples of wet moulded rubber goods as well as samples of transparent rubber and rubber glass, an invention foreseen by Mr. H. G. Wells many years ago, and now almost perfected.

From Week to Week

Mr. F. A. Hong, B.Sc., of King's College, London, has been appointed demonstrator in physics at Leeds University.

Mr. Donald Hope has been appointed a director of Nobel Industries, Ltd., in place of Mr. W. A. Tennant, who has retired.

At a meeting of the Royal Institution, to be held on January 20, Sir James Dewar will deliver a lecture on "Soap Films and Molecular Forces."

It was reported in Glasgow on Monday that prices of lubricating oils had been reduced to the extent of from 15s. to £6 per ton, according to grade.

Damage roughly computed at £500 was caused by fire ecently at the premises of Mr. J. W. Bortnwick, soap and chemical merchant, of High Street, Hawick.

Courtin & Warner, Ltd., chemical and essential-oil merchants, have removed to larger premises at 13, Harp Lane, London, E.C. 3. The telephone number is Minories 1444-5-6.

Among the papers read at the third ordinary meeting of the Royal Society of Edinburgh on Monday was one entitled "Some Simple Experiments on the Colloidal Content of Soils," by Mr. T. B. Franklin.

At the next ordinary scientific meeting of the Chemical Society, to be held on January 19, at 8 p.m., Professor Arthur Smithells will give an account of the Lewis-Langmuir Atom, and will exhibit models.

In a letter to the *Times* on Monday, Dr. A. P. Laurie, Professor of Chemistry to the Royal Academy, stated that linseed oil properly prepared and properly used is the most permanent medium for painting pictures.

Professor C. Moureu, president of the International Union of Pure and Applied Science, was the guest of honour at a dinner given by the American Section of the Société de Chimie Industrielle in New York on December 20.

An engagement is announced between Professor Haworth, Director of the Chemistry Department of Armstrong College, Newcastle-on-Tyne, and Miss Violet C. Dobbie, second daughter of Sir James J. Dobbie and Lady Dobbie, of Fairlie, Ayrshire.

Mr. Wilfrid Wyld, consulting chemical engineer, of Leeds, is leaving England at the end of this month, for the purpose of erecting several chemical plants in India. Upon his return he hopes to continue his practice as consultant at his old address.

A paper on "Machinery for the Production and Refining of Edible Oils for Margarine, &c.," by Mr. B. P. Flockton, was read on Wednesday at a meeting of the Association of Engineers-in-Charge, held at St. Bride's Institute, Bride Lane, London. Professor J. W. Hinchley was in the chair.

Speaking on Monday at the annual meeting of Champion & Slee, Ltd., Mr. J. Wright said the legitimate vinegar brewing trade still continued to be detrimentally affected by the operations of a certain class of traders who sold as vinegar a concoction which was nothing but acetic acid, water, and colouring.

At a dinner of the United States National Petroleum War Service Committee, held in New York last week, Sir John Cadman, the late chairman of the Inter-Allied Petroleum Council, stated that the British oil policy was an "open door" policy, and that the co-operation of American capital would be welcomed.

German imports into the United Kingdom during November last were £18,305 more than in October. Scientific and domestic glassware fell by some £18,750 in value, while decreases under scientific instruments account for a drop of £18,746. Alizarine shows an increase of £4,323, the quantities being 1,401 cwt. as against 28 cwt.

Sir Charles Greenway announced at the annual meeting of the Steaua Romana (British), Ltd., on January 5, that while drilling operations in Roumania covered over 10,000 metres, they hoped, during the present year, to drill 20,000 metres. The company's tin-making plants were working at Constantza, Smyrna, Salonika, and in Bulgaria.

Several people were slightly injured in an explosion on January 6 at the works of W. Vernon & Sons, Waterloo Bridge Road, London. The explosion occurred during the process of mixing oatmeal in a bin. It was of a spontaneous character and is thought to have been due to an admixture of dust and aip

The time appointed for lodging objections to the lists issued by the Board of Trade under the Safeguarding of Industries Act expired on January 7, and the Chemical Merchants' and Users' National Vigilance Committee have handed in formal objections to 120 articles. Other bodies are reported to have sent in objections, one comprising 210 articles.

The District Committee of the Lower Ward of Lanarkshire have granted an application by Royston Soaps, Ltd., for permission to establish a soapmaking factory at Huntershill Quarry, Bishopbriggs. It was stated on behalf of the applicants that work would be carried on in extended premises of the Rubber Tar Co., Ltd., and that about fifty men would be employed.

The question of the introduction of liquid air explosives as a substitute for gunpowder in ironstone mining is engaging the attention of Cleveland ironmasters. Recently deputations of Cleveland ironmasters visited Lorraine and witnessed the use of these explosives. They were so satisfied with the results that they have arranged for a series of demonstrations in the Cleveland mines early this year.

The directors of Van den Berghs, Ltd., have appointed Mr. Henry Van den Bergh to the position of chairman of the board, and they now recommend that Sir Walter Townley, formerly British Minister at the Hague, be appointed as a director representing the interests of the preference shareholders. A meeting for this purpose will be held at Winchester House, London, on January 18, at noon.

The British Sugar Beet Growers' Society, Ltd., in response to requests for a sample of home-grown sugar now being produced at the Kelham Beet Sugar Factory, has secured a limited supply for making up into 5 lb. sample bags. One of these sample bags will be sent direct post free on the filling up of a form and the remittance of 5s. The profit on these samples will be devoted to the work of the society.

The authorities of the Universities of Birmingham, Durham, Leeds, Liverpool, Manchester, and Sheffield have addressed to the Prime Minister a memorandum, and the Vice-Chancellors of Oxford, Cambridge, London, Bristol, Glasgow, Aberdeen and Wales have notified to Mr. Lloyd George their concurrence, setting out the dangers of any reduction in the grants made by the Government to the universities and university colleges of Great Britain.

An account of the phosphate deposits and workings on Nauru and Ocean Island, prepared by the Australian Commissioner on the Board controlling the phosphate business of the islands, and published by the Government of the Commonwealth of Australia, may be seen by United Kingdom firms interested, on application at the Inquiry Room of the Department of Overseas Trade, 35, Old Queen Street, Westminster, S.W. 1.

The Agent-General for Western Australia announces that Professor Sir Edgeworth David, of the Sydney University, who recently made a tour of geological exploration in Central Australia, when interviewed on his return to Sydney in regard to the discovery of mineral oil indications at East Kimberley, Western Australia, said that the discovery at Kimberley was, so far as was known, the first recorded occurrence of true mineral oil in Australia, and while caution was needed, the prospects from a geological point of view appeared to be distinctly encouraging.

The list of speakers on current political problems arranged for the fortnightly meetings of the 1920 Club, up to the end of April, include Mr. F. E. Hamer, editor of The Chemical Age ("The Labour Party"), Señor Merry del Val, Spanish Ambassador ("The Place of Spain in Modern Civilisation"), Mr. F. G. Kellaway, M.P., Postmaster-General ("Post Office Perplexities"), Lord Beaverbrook ("Imperial Solidarity"), Mr. C. A. McCurdy, M.P., Chief Liberal Coalition Whip ("The Future of Liberalism"), and Mr. E. S. Montagu, M.P., Secretary for India ("The Place of India in the Empire").

At the quarterly meeting of the Staffordshire Education Committee last week reference was made to the death of Mr. Walter Macfarlane, F.I.C., Emeritus Principal of the County Technical College, Wednesbury, who retired in August last after twenty-five years' work. "South Staffordshire," said the report of the committee, "owes him a great debt for the solid foundation of metallurgical teaching which he laid down in days when the need for it was barely recognised but which had its reward in the ready and successful establishment of the Technical College, which was completed in 1914.

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Abstracts of Complete Specifications

172,337. SULPHATE OF AMMONIA, APPARATUS FOR USE IN THE MANUFACTURE OF. R. P. Douglas, 12, Nelson Square, Bolton, Lancs. Application date, September 20, 1920.

In the manufacture of sulphate of ammonia the crystals when taken from the saturator are sometimes placed on a perforated floor or partition to drain away the liquid, but it is found that the lower parts of the sulphate frequently retain too much liquid. In the present invention the sulphate of ammonia is removed from the saturator and placed in a vessel having a perforated floor which is mounted on a chamber to which suction can be applied. The liquid passing through the perforated floor is received by a funnel the outlet of which extends downwards nearly to the bottom of the suction chamber, so that it forms a seal for the liquid in this chamber. The suction pump is connected to the suction chamber at a point above the level of the liquid in it. The vessel containing the sulphate of ammonia may be provided with trunnions, so that it may be suspended on a truck for transportation from place to place. The vessel may be of wood or lead, or cast iron lined with lead or copper. If neutral ammonium sulphate is required, the crystals may be washed with water and then with ammonia.

172,356. ORES OR METALLURGICAL PRODUCTS, PREPARATORY TREATMENT OF. O. Imray, London. (From Jackson & Co., Valparaiso, Chile.) Application date, July 28, 1920.

The process is for treating complex ores, metallurgical concentrates and precipitates, with a nitrate or other oxidising agent to facilitate the subsequent treatment of the ore by water concentration, flotation, magnetic separation, or amalgamation. The ore is heated in a furnace with a nitrate or nitrite or mixture of these in solid form or in solution. The nitrate is added in the proportion of 0.5 to 2 per cent., and the mixture is heated to a dull red heat for five to ten minutes. In some cases the ore is first heated in the furnace and then sprayed with an aqueous solution of nitrate. In other cases the desired effect may be obtained by wetting the ore with a solution of nitrate and leaving it exposed to the action of the air for a considerable time. The ore is then treated with a bleaching solution. This preparatory treatment is particularly suitable for ores which are subsequently treated with cyanide solutions, three important effects being produced: (1) The disintegrating effect which liberates metallic gold and silver particles and makes the ores more porous and more readily treated with cyanide. (2) In the case of silver ores the silver sulphides and combined sulphides of silver, antimony, arsenic, and copper become more soluble in water or cyanide solutions. Most of the troublesome base minerals can then be removed by washing with water. (3) If the ore contains sulphides, these are converted into soluble sulphates, which may be removed by washing with water, and the destructive effect of the sulphur on the cyanide is thus avoided. Several examples of the application of the process to complex ores of silver and gold are described.

172,358. EXPRESSING LIQUIDS FROM MATERIALS CONTAINING THE SAME, METHODS AND APPARATUS FOR. J. W. Hinchley, 55, Redcliffe Road, London, S.W. Application date, August 3, 1920.

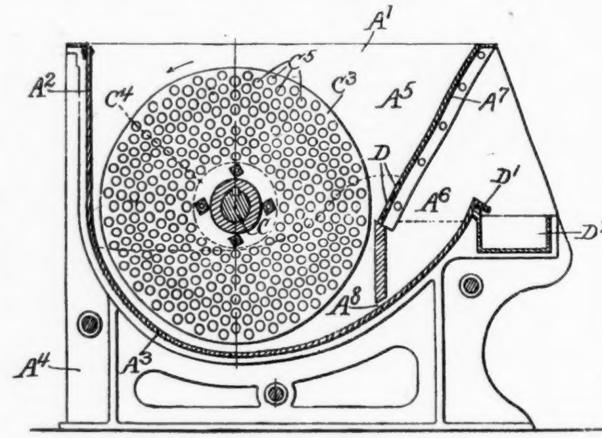
The apparatus is more particularly for treating materials such as wet peat. Freshly excavated peat usually contains about 90 per cent. of water, while "slurry peat" may contain 95 per cent. of water. The apparatus is mainly for converting such peat into "semi wet" peat containing 80 per cent. of water. The wet material is delivered on to one end of a horizontal endless conveyor provided with transverse ribs and side walls, which form a series of pockets. Another endless conveyor is mounted immediately above, and is provided with similar transverse ribs which are adapted to enter the pockets in the lower conveyor. The length of the sections in the upper conveyor and their speed are slightly greater than those of the lower conveyor, so that each transverse rib moves forward in the corresponding pocket during the period in which they are engaged. The wet peat is thus subjected to a compression, which gradually increases from one end of the conveyor to the other. The bottom of each pocket is perforated to allow the expressed water to escape.

172,359. PEAT, METHOD OF AND APPARATUS FOR TREATING. W. W. Blair, 34, Otis Street, Newtonville, Middlesex, Mass., U.S.A. Application date, August 3, 1920.

The process is for improving the fuel value of peat. The fresh peat is compressed into blocks, which are dried and then conveyed by an endless conveyor through a bath of low-grade fuel oil, which may be heated to render it less viscous. The blocks may be formed with openings through them to facilitate drying. Reference is directed in pursuance of Sec. 7, Sub-sec. 4, of the Patents and Designs Acts, 1907 and 1919, to Specifications Nos. 1237/1891, 16,920/1897, 17,119/1898, and 18,282/1902.

172,390. SEPARATING FINELY DIVIDED MINERALS FROM THEIR ORES BY FROTH FLOTATION, PROCESS OF AND APPARATUS FOR. F. J. Brougham, London. (From D. P. Hynes, 1025, Peoples Gas Building, Chicago, Ill., U.S.A.) Application date, September 2, 1920.

A tank for containing the ore pulp which is to be treated is provided with a curved bottom A^3 and with a partition A^7 dividing it into two communicating compartments A^5, A^6. The lower edge of the partition A^7 terminates above the bottom of the tank, leaving a passage A^8. A horizontal shaft C extending through the tank carries a number of parallel thin circular discs C^3, which are maintained at the required distance apart by spacing rings C^4. Each disc



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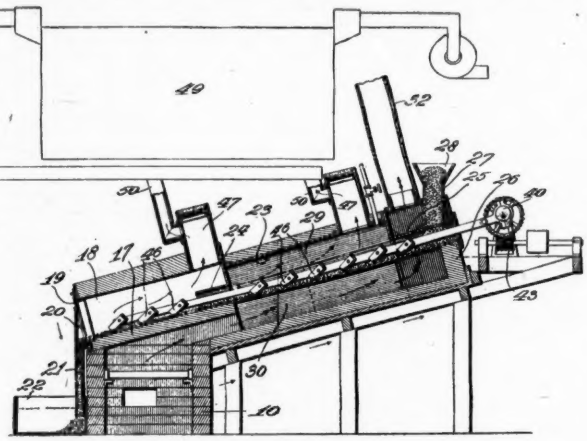
is provided with numerous perforations C^5, and the discs are spaced at such a distance apart as to enable the ore pulp between them to be lifted by their rotation. The discs project partly above the surface of the liquid, so that air is trapped in the perforations and carried into the pulp, which is thereby aerated. The perforations may be replaced by projections or ridges, or a woven wire disc may be used. The aerated pulp passes through openings D in the partition A^7 into the chamber A^6, and the froth carrying the mineral particles is continuously discharged into a launder D^2, while the tailings pass back through the passage A^8.

172,401. RETORTS. J. M. Johns, J. H. Curran, F. W. Lowe, and J. B. Trescott, Rialto Theatre Building, 320, North Grand Avenue, St. Louis, Mo., U.S.A. Application date, September 3, 1920.

The retort is more particularly for the continuous dry distillation of materials containing a proportion of liquid hydrocarbon, *e.g.*, oil shale, lignite, peat, cannel coal, bituminous coal, &c. The retort is supported at an angle of 10°-15° to the horizontal with its lower end immediately above a furnace-setting 10. A partition 17 extends from the top of the furnace a short distance into the retort, so that the chamber 18 immediately above it constitutes the high temperature chamber of the retort. The lower end of this chamber is closed by a plate 19 having an opening 20 communicating with a narrow tube 21 extending downwards into a tank 22 which is filled with water, so that the spent material from the retort is discharged into a water seal. A rectangular chamber 23

of metal is arranged in the upper portion of the retort above the chamber 18, and is provided with a rectangular extension 24 projecting into the chamber 18, while a similar extension 25 projects at the opposite end and rests on the rear wall 26 of the retort. The chamber 30 formed below the low temperature chamber 29 communicates with the furnace 10 at one end and with the stack 32 at the other end. The retort contains a framework guided on rails at the sides and carrying transversely-pivoted gravity scrapers 46, which are reciprocated over the bottom of the heating chambers by an eccentric 40, driven by a worm 43. The retort is preferably arranged at an angle to the horizontal slightly less than the angle



172,401.

of repose of the pulverised shale, so that little power is required to move the material downwards through the retort. The action of the scrapers 46 ensures the passage of the material in a continuous stream of uniform depth. The material is supplied from a hopper 28 through a shoot 27 and the vapours from the high and low temperature zones are collected in domes 47, from which they pass by pipes 50 to a condenser 49. In the distillation of pulverised oil shale the chamber 18 is heated to 1,000-2,000° F., and the chamber 29 to 900-1,000° F. In this case the speed of reciprocation of the gravity-scrapers 46 should be about two complete strokes per minute. The retort is particularly suitable for treating material which has been pulverised to an impalpable powder.

172,411. Reduction of Metallic Oxides (Ores), Process and Furnace for. H. F. Eriksson, Pershyttan Nora, Sweden. Application date, September 6, 1920.

The process is principally for the reduction of iron oxides. The ore is charged into the upper part of the furnace *b* either

Fig. 2.

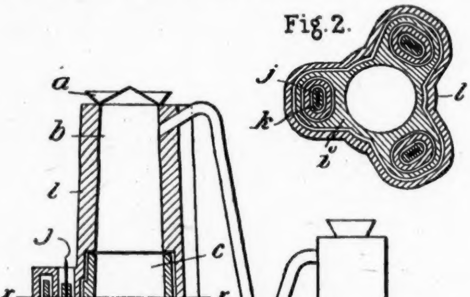


Fig. 1.

172,411

alone or mixed with a smaller quantity of solid reducing substance than that necessary for complete reduction. The mixture is preheated in the chamber *b* and passes downward into the reduction chamber *c*, which is surrounded by a number of iron cores *j*. These cores are surrounded by copper coils *k*, which, together with the reduction chamber *c*, are enveloped by an iron sheathing *i*. An electric current is passed through the coils *k*, and the secondary current induced in the iron *i* heats the latter together with the ore in the chamber *c*. Carbonaceous material is heated in a retort furnace *m*, and carbon monoxide is drawn through a pipe *r* by a pump *n* and delivered to the bottom of the reduction furnace. The ore is reduced by the solid-reducing agent and the carbon monoxide, and the spongy metal produced is withdrawn from the cooling chamber *b* through the openings *e*. Carbon monoxide and dioxide are drawn off through the top of the furnace and delivered by the pipes *o*, *p*, to the retort *m*, where the dioxide is converted into monoxide for use again.

172,491. Filters. A. M. Capro, 34, Queen Street, Philadelphia, Pa., U.S.A. Application date, October 29, 1920.

The filtering vessel contains three superposed layers of filtering material, a layer of coarse material at the top and two lower layers which are progressively more finely divided. Each layer of filtering material is contained in a detachable wire basket, each successive basket being of larger diameter from the bottom upwards. The baskets are arranged in three superposed compartments in the filtering vessel, which are of corresponding diameters. The baskets are retained in their respective compartments by means of a ring which is secured to the filtering vessel so as to press upon the flange of the uppermost basket. The liquid to be filtered is passed downwards through the successive layers of filtering material.

172,513. Mixing, Stirring or Agitating Apparatus. W. W. Veitch, M. H. Rowlands, and Rowlandson (Engineers), Ltd., 21, Dale Street, Liverpool. Application date, November 26, 1920.

The mixing apparatus is of the kind in which a vessel having a lower hemispherical part is provided with a horizontal rotating shaft carrying mixing blades. The blades are mounted on the shaft in pairs diametrically opposed, and each comprises a radial arm having a flattened portion at its outer end, which rotates nearly in contact with the bottom of the vessel. The outer edge of the blade is curved to correspond with the periphery of the vessel. Each successive pair of blades is arranged on the shaft at right angles to the adjacent pair of blades. The mixing effect of the blades is increased by inclining the two blades of each pair in opposite directions at about an angle of 15°. A discharge opening in the bottom of the vessel is closed by a plate sliding in guide members. The underside of the plate is provided with a rack by which it may be operated through the medium of a toothed pinion carried by a horizontal shaft.

172,517. Centrifugal Separators. A. Ohno, 3, Yayoi-Cho, Mukogaoka, Hongo-Ku, Tokio, Japan. Application date, November 30, 1920.

The centrifugal separator is driven by a vertical driving shaft, to which it is connected by means of a universal joint, which enables the container to adjust itself automatically to a position in which the centre of gravity is in the axis of rotation. The vertical shaft is connected at its upper end to a fly-wheel, which is provided with an upwardly extending hollow hub enclosing the top of the shaft. The hub is connected to the shaft by means of an intermediate gimbal ring having two pairs of pivots at right angles, so that the fly-wheel is suspended below this joint. The upper end of the hub is provided with an axial pivot, which is connected to the container through an intermediate gimbal ring in a similar manner.

Note.—Abstracts of the following specifications which are now accepted appeared in The Chemical Age when they became open to inspection under the International Convention: 146,166 and 146,180 (H. Renner and W. Moeller), relating to tanning agents, *see* Vol. III., p. 320; 146,181 (Gerb. und Farbstoffwerke H. Renner & Co.), relating to tanning agents, *see* Vol. III., p. 321; 146,839 (J. I. Bronn), relating to coke-oven gases, *see* Vol. III., p. 381; 147,861 (A. Franck-Philipson), relating to a coal-tar derivative disinfectant, *see* Vol. III., p. 454; 151,596 (Soc. d'Etudes Chimiques pour l'Industrie), relating to converting cyanamide into urea

see Vol. III., p. 690; 151,597-8, 154,562 and 159,853-4 (Soc. d'Etudes Chimiques pour l'Industrie), relating to manures containing nitrogen and phosphorus, *see* Vol. III., p. 690 and Vol. IV., pp. 195 and 567.

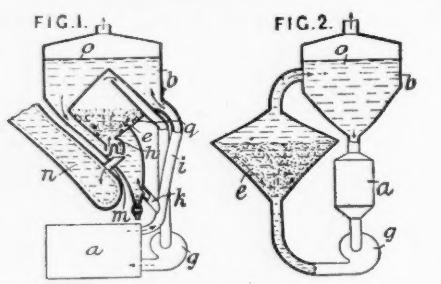
International Specifications not yet Accepted

171,367. MOTOR FUEL; HYDROGENATING HYDROCARBONS. M. Melamid, 9, Urachstrasse, Freiburg, Germany. International Convention date, November 11, 1920.

Tar oil is heated to about 300° C. in a tin-lined vessel containing also metallic tin, and hydrogen is passed in at a pressure of 15-20 atmospheres. After a few hours the contents are fractionated, and about 80 per cent. of the oil distils below 200°C. The residue is a lubricating oil.

171,370. CRYSTALLISING. Aktieselskabet de Norske Saltverker, Bergen, Norway. International Convention date, November 9, 1920.

The apparatus is for obtaining granular crystals of salts such as sodium chloride. The saturated solution of salt passes from a vessel *b* through an inner chamber *e* to a pump *g*, which forces it through a superheater *a* and pipe *i* back to the vessel *b*. The solution evaporates in the vessel *b*, so that the solution which enters the bottom of the vessel *e* is supersaturated. The vessel *e* contains a mass of small crystals which are agitated by the solution and thus grow in granular form. When the crystals are too large for agitation by the liquid they are directed by baffles towards the discharge opening *h* and thence through a passage *m* to an elevator *n*. If the solution increases only slightly in strength with rise of temperature the apparatus shown in Fig. 2 is used. The solution is circulated through the vessel *b*, superheater *a*, pump *g*, and crystallising vessel *e*, while fresh solution is discharged by a jet into the



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upper part of the vessel *e*, to prevent small crystals from passing into the vessel *b*. Alternatively the small crystals may be separated by centrifuging or by filtration. The superheater *a* may be omitted, and supersaturation obtained by cooling the liquid surface *o*. Part of the circulating liquid may be passed directly into the bottom of the vessel *b* through the pipe *k*.

171,931. CARRIERS FOR CATALYTIC MATERIALS. Stockholms Superfosfat Fabriks Aktiebolag, 4, Kornhamnstorg, Stockholm. International Convention date, November 9, 1920.

Acetone is produced by passing acetic acid vapour over a catalyst of calcium or barium oxide, hydrate, carbonate or acetate heated to 300°-400° C. The catalyst is supported on a carrier of granular aluminium which is produced as follows: The molten metal is allowed to cool, and is vigorously stirred, so that rough porous granules are produced. This material is boiled in a solution or suspension of the catalyst, which is thus deposited on it.

LATEST NOTIFICATIONS

173,479. Process of purifying lactic acid. Schatzkes, J. December 27, 1920.

173,491. Working of cross-current re-cooling devices. Kohler, C. December 27, 1920.

173,498. Process for lining metal tubes, pipes, and the like. Arens, F. December 27, 1920.

173,502. Manufacture of magnesia from dolomite. Clere, C. and Nihoul, A. December 24, 1920.

173,504. Preparation of pulverulent fuels in view of the transformation of their ashes in hydraulic cements. Bouchard-Praceiq, E. December 24, 1920.

173,520. Regulation of compressors or pumps working in parallel. Graemiger, B. December 30, 1920.

Specifications Accepted, with Date of Application

148,126. Tanning agents and the application thereof. Chemische Fabriken Worms Akt.-Ges. July 20, 1916.

149,347. Separating solid and liquid hydrocarbons from each other, Process for. Deutsche Erdol Akt.-Ges. July 31, 1919.

153,006. Gas liquor, Treatment of—to extract a fertilizer therefrom. Ges. für Landwirtschaftlichen Bedarf and R. Mandelbaum. Feb. 24, 1919.

157,219. Gas and Coke, Continuously-working distilling oven for the manufacture of. Gewerkschaft ver Constantin Der-Grosse. May 7, 1919.

158,531. Dyeing, Process of. Surpass Chemical Co., Inc. January 30, 1920.

161,977. Grinding or crushing apparatus. M. J. Davidsen. April 22, 1920.

164,715. Oxyaldehydes and their derivatives, Process for the manufacture of. Soc. Chimique des Usines du Rhone, Anciennement Gilliard, P. Monnet, et Cartier. June 9, 1920.

173,004. Butyric aldehyde, Production of—and butyric acid therefrom. M. A. Adam and D. A. Legg. July 20, 1920.

173,006. Dyestuff intermediates, Production of. J. Thomas, M. O. Davies, and Scottish Dyes, Ltd. July 23, 1920.

173,028. Electrolytic cells, more especially intended for use in the production of the chlorates of the alkali metals. J. T. Barker and United Alkali Co., Ltd. Sept. 10, 1920.

173,060. Sulphuric acid, Processes for making. C. J. Reed. September 20, 1920.

173,063. Camphoric acid, Manufacture of soluble derivatives of. O. Y. Imray (*Society of Chemical Industry in Basle*). September 21, 1920.

173,097. Alcohols, ketones and the like, Manufacture and production of. J. Y. Johnson. (Badische Anilin & Soda Fabrik.) October 9, 1920.

173,099. Carbonisation and distillation of carbonaceous material. J. A. Chown. October 9, 1920.

173,166. 1-chloro-2-amino-anthraquinone, Manufacture of. A. W. Fyfe and British Dyestuffs Corporation, Ltd. December 21, 1920.

Applications for Patents

American Cotton Oil Co. Apparatus for moulding and cooling soap. 316. January 4. (United States, March 5, 1921.)

Beninson, M., Gros, F. and Simoneff, M. System of distilling petroleum. 300. January 4.

British Thomson-Houston Co., Ltd., and General Electric Co. Purification of oil. 66. January 3.

Chemische Werke vorm. Auerges (formerly Ges. für Verwertung Chemischer Produkte). Processes for producing pure titanic acids from titanic ores. 363. January 5. (Germany, January 8, 1921.)

Clavel, R. Treatment of cellulose derivatives. 414, 415. January 5.

Corthesy, J. H., and Dickson, W. K. L. Distillation of liquid hydrocarbons, &c. 323. January 5.

Douglas, R. P. Manufacture of sulphate of ammonia. 441. January 6.

Elektrizitätswerk Lonza. Process for improving electrolytic mercuric oxide. 567. January 7. (Switzerland, January 8, 1921.)

Inhabad Ges. Apparatus for breathing in noxious gases. 304. January 4. (Germany, January 4, 1921.)

Kotchmann, W. Combustible mixture for generating gases under pressure. 579. January 7. (Germany, January 10, 1921.)

Löwe, H. Manufacture of saccharin. 389. January 5. (Switzerland, January 31, 1921.)

Marshall, C. L. Manufacture of expanded vulcanised rubber, &c. 317. January 4.

Metallurgical Development Corporation and Haddan, R. Treatment of arsenical ores and materials. 171. January 3.

Plauson's (Patent Co.) and Plauson, H., Ltd. (Plauson). Separation of materials. 27. January 3.

Power Specialty Co. and Robertson, T. E. Apparatus for distilling oils, &c. 235. January 4.

Soc. of Chemical Industry in Basle and Imray, O. Y. Manufacture of dyestuffs from anthraquinone. 474. January 6.

Thermal Industrial and Chemical (T.I.C.) Research Co., Ltd. and Morgan, J. S. Filtering-apparatus. 264. January 4.

Thermal Industrial and Chemical (T.I.C.) Research Co., Ltd. Heat treatment of substances by molten metal. 265. January 4.

Trent Process Corporation. Treatment of material having an oil-producing content. 72. January 3. (United States, January 20, 1921.)

An Advance in Newspaper Production Methods

ON January 6, the *Blackpool Times* was produced by the photo-litho offset process, which does away with the necessity of making half-tone blocks for illustrations. The proprietors inform us that it is the first newspaper to be printed by this method in the United Kingdom.

Monthly Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

British Market Report

LONDON, JANUARY 12, 1922.

THERE has been marked stagnation in the chemical market during the past week, but there are signs that the demand is improving slightly as we go to press. Prices generally are firm, and on the whole the tendency is upward.

The export demand has been rather better, although there is much room for improvement.

General Chemicals

ACETONE is in steady demand, but orders are mostly of the hand-to-mouth variety. The spot price is firm.

ACID ACETIC.—A better business has been passing for home consumption, and export inquiry is fairly brisk.

ACID CITRIC is rather lower in price, and the tendency is in buyers' favour.

ACID FORMIC.—This article is much firmer; stocks have been considerably reduced and higher prices are expected.

ACID OXALIC is a firm market, and any improvement in demand would quickly affect the situation.

ACID TARTARIC.—There is no particular change to report; the demand is still spasmodic.

COPPER SULPHATE.—The price is maintained, but business is nominal.

FORMALDEHYDE.—Stocks are inclined to hang fire, no doubt on account of the tendency of manufacturers to withhold orders during the stocktaking period. The undertone remains firm.

LEAD ACETATE.—There has been a little better demand, and prices are firm.

LEAD NITRATE.—The price is very unprofitable to manufacturers. The demand is nominal, and there is no sign at present of any improvement.

LITHOPONE is a steady market, and the general conditions seem likely to improve.

POTASSIUM CARBONATE is still on offer on re-sale account. The market is overstocked and the tendency remains weak.

POTASSIUM CAUSTIC is in poor demand, and the tendency is easy.

POTASSIUM CHLORATE.—A little more business has been passing; price unchanged.

POTASSIUM PRUSSIATE.—There is little of continental make to be obtained over the next three months, and a further rise in price seems likely.

SODIUM ACETATE has been in better inquiry, and the price is well maintained.

SODIUM NITRITE.—Only a nominal business is reported, with no change in price.

SODIUM PRUSSIATE.—An active business has been passing. Works seem to be well sold out over the whole year. The price has again advanced strongly.

Coal Tar Intermediates

Business during the past week has been far from brisk, but a certain amount of interest is about, and a fair inquiry has been received, both on home and export account.

ALPHA NAPHTHOL is featureless.

ALPHA NAPHTHYLAMINE.—A fair inquiry has been received and one or two good orders are in the market.

ANILINE OIL AND SALT.—As indicated in our previous report, these materials were considerably reduced by makers last week, but so far the new prices do not appear to have stimulated business. There are still certain re-sale parcels on the market, and these are, as a rule, obtainable at slightly below makers' prices.

BENZIDINE BASE.—A steady small business is being carried on.

BETA NAPHTHOL has been inquired for both on home and export account, but this intermediate is still quiet.

DIMETHYLANILINE is steady.

DIPHENYLAMINE has been inquired for on export account, and the price is firm.

"H" ACID.—A fair business is passing, and re-sale parcels seem to have been absorbed.

NAPHTHIONIC ACID is in quiet steady demand.

NITROBENZOL.—The usual small business is passing.

PARAPHENYLENEDIAMINE is slightly easier.

Coal Tar Products

Markets generally are quiet but firm.

90's BENZOL is selling at 2s. 5d. to 2s. 6d. per gallon.

PURE BENZOL is unchanged at 3s. in the North, and 3s. 6d. in London.

CREOSOTE OIL.—There is a fair inquiry, and to-day's quotations are 5½d. to 5¾d. in the North, 6¼d. to 6½d. in the South.

CRESYLIC ACID is quiet without change in value.

SOLVENT NAPHTHA is still in poor demand, without change in price.

NAPHTHALENE is quiet and without change.

PITCH.—There is a fair demand for prompt parcels, and to-day's values are 60s. to 62s. 6d. f.o.b. London, 56s. 3d. to 57s. 6d. f.o.b. East Coast, 55s. to 56s. 3d. f.o.b. West Coast.

Sulphate of Ammonia

The home trade prices are unchanged, and the demand for export is only limited.

French Market Report

Trade has been very quiet, and prices in most cases are inclined to break still further, and many markets still continue under the influence of re-sellers. All quotations are per 100 kilos.

ACETIC ACID, 80 per cent., 180 frs.
ACID BORACIC, 360 frs.
ACID LACTIC, 200 frs.
ACID OXALIC, 400 frs.
ACETONE, 525 frs.
ALUM CHROME, 150 frs.
ALUM LUMP, 100 frs.
AMMONIA PHOSPHATE, 300 frs.
BLEACHING POWDER, 75 frs.
CALCIUM CHLORIDE, 40 frs.
LITHOPONE, 150 frs.
LEAD ACETATE, 300 frs.
LEAD NITRATE, 360 frs.
POTASSIUM BICHROMATE, 365 frs.
POTASSIUM CARBONATE, 190 frs.
POTASSIUM METABISULPHITE, 450 frs.
POTASSIUM PERMANGANATE, 10 frs. per kilo.
POTASSIUM PRUSSIATE, 550 frs.
SODIUM BICARBONATE, 50 frs.
SODIUM BICHROMATE, 310 frs.
SODIUM CAUSTIC, 90 frs.
SODIUM HYPOSULPHITE, 80 frs.
SODIUM NITRITE, 325 frs.
SODIUM PRUSSIATE, 350 frs.
SODIUM SULPHIDE, 160 frs.
ZINC WHITE, 225 frs.

German Market Report

Business has now become much quieter, and markets in most cases are quite nominal. Buyers show great reluctance to purchase any further quantities forward, and it would not be surprising to see markets break in many instances for future deliveries. The following are the chief prices, all being per kilo unless otherwise stated:

ACID ACETIC, 80 per cent., 18 marks.
ACID OXALIC, 45 marks.

ALUM CHROME, 28 marks.
ALUM CRYSTALS, 13 marks.
ALUMINA SULPHATE, 17/18 per cent., 10 marks.
AMMONIA CARBONATE, 15 marks.
BARIUM CHLORIDE, 11 marks.
CALCIUM CHLORIDE, 5 marks 50.
FORMALDEHYDE, 30 marks.
IRON SULPHATE, 2 marks 50.
LITHOPONE, Red Seal, 16 marks 50.
LEAD ACETATE, 33 marks.
MAGNESIUM CHLORIDE, Solid, 5 marks 50.
POTASSIUM BROMIDE, 50 marks.
POTASSIUM CAUSTIC, 20 marks.
POTASSIUM PERMANGANATE, 40 marks.
SODIUM HYPOSULPHITE, Crys., 8 marks 50.
SODIUM SULPHIDE CONC., 18 marks.

Current Prices

Chemicals

	Per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	1	10	to	0	2	0
Acetone oil	ton	87	10	0	to	90	0	0
Acetone, pure	ton	82	10	0	to	85	0	0
Acid, Acetic, glacial, 99-100%	ton	52	10	0	to	55	0	0
Acetic, 80% pure	ton	45	0	0	to	46	0	0
Arsenic	ton	90	0	0	to	95	0	0
Boric, cryst	ton	65	0	0	to	68	0	0
Carbolic, cryst. 39-40%	lb.	0	0	6¼	to	0	0	7
Citric	lb.	0	2	1	to	0	2	2
Formic, 80%	ton	65	0	0	to	67	10	0
Gallic, pure	lb.	0	3	10	to	0	4	0
Hydrofluoric	lb.	0	0	8½	to	0	0	9
Lactic, 50 vol.	ton	40	0	0	to	43	0	0
Lactic, 60 vol.	ton	43	0	0	to	45	0	0
Nitric, 80 Tw.	ton	35	0	0	to	36	0	0
Oxalic	lb.	0	0	8	to	0	0	8½
Phosphoric, 1.5	ton	45	0	0	to	47	0	0
Pyrogallic, cryst	lb.	0	7	0	to	0	7	3
Salicylic, Technical	lb.	0	0	10½	to	0	1	0
Salicylic, B.P.	lb.	0	1	4	to	0	1	5
Sulphuric, 92-93%	ton	8	0	0	to	8	10	0
Tannic, commercial	lb.	0	3	0	to	0	3	6
Tartaric	lb.	0	1	3	to	0	1	4
Alum, lump	ton	12	10	0	to	13	0	0
Alum, chrome	ton	30	10	0	to	32	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	12	0	0	to	13	0	0
Aluminium, sulphate, 17-18%	ton	13	10	0	to	14	10	0
Ammonia, anhydrous	lb.	0	1	8	to	0	1	10
Ammonia, .880	ton	35	0	0	to	37	0	0
Ammonia, .920	ton	22	0	0	to	24	0	0
Ammonia, carbonate	lb.	0	0	4	to		—	
Ammonia, chloride	ton	60	0	0	to	65	0	0
Ammonia, muriate (galvanisers)	ton	35	0	0	to	37	10	0
Ammonia, nitrate	ton	55	0	0	to	60	0	0
Ammonia, phosphate	ton	90	0	0	to	95	0	0
Ammonia, sulphocyanide	lb.	0	3	0	to		—	
Amyl acetate	ton	150	0	0	to	160	0	0
Arsenic, white, powdered	ton	42	0	0	to	44	0	0
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0
Barium, Chlorate	lb.	0	0	11	to	0	1	0
Chloride	ton	14	10	0	to	15	10	0
Nitrate	ton	40	0	0	to	42	0	0
Barium Sulphate, blanc fixe, dry	ton	24	0	0	to	25	0	0
Sulphate, blanc fixe, pulp	ton	15	0	0	to	16	0	0
Sulphocyanide, 95%	lb.	0	1	6	to	0	1	0
Bleaching powder, 35-37%	ton	14	0	0	to		—	
Borax crystals	ton	31	0	0	to	32	0	0
Calcium acetate, Brown	ton	8	0	0	to	9	0	0
" " Grey	ton	10	0	0	to	11	0	0
Calcium Carbide	ton	16	0	0	to	17	0	0
Chloride	ton	7	10	0	to	8	0	0
Carbon bisulphide	ton	60	0	0	to	62	0	0
Casein, technical	ton	75	0	0	to	80	0	0
Cerium oxalate	lb.	0	3	6	to	0	3	9
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb.	0	11	0	to	0	11	6
Oxide, black	lb.	0	10	6	to	0	11	0
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	28	10	0	to	29	0	0
Cream Tartar, 98-100%	ton	120	0	0	to	125	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde, 40% vol	ton	81	0	0	to	82	0	0
Formusol (Rongalite)	lb.	0	3	9	to	0	4	0
Glauber salts, commercial	ton	4	5	0	to	4	10	0
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols	gal.	0	2	6	to	0	2	7
Iron perchloride	ton	30	0	0	to	32	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	42	10	0	to	45	0	0
Carbonate (White Lead)	ton	44	0	0	to	47	0	0
Nitrate	ton	48	10	0	to	50	10	0
Litharge	ton	35	10	0	to	36	0	0
Lithopone, 30%	ton	26	0	0	to	27	0	0
Magnesium chloride	ton	10	10	0	to	11	0	0
Carbonate, light	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	9	10	0	to	10	0	0
Sulphate (Druggists')	ton	15	10	0	to	17	10	0
Manganese, Borate	ton	70	0	0	to	75	0	0
Sulphate	ton	70	0	0	to	75	0	0
Methyl acetone	ton	85	0	0	to	90	0	0
Alcohol, 1% acetone	ton	90	0	0	to	95	0	0
Nickel sulphate, single salt	ton	61	0	0	to	62	0	0
Nickel ammonium sulphate, double salt	ton	62	0	0	to	64	0	0
Potash, Caustic	ton	34	0	0	to		—	
Potassium bichromate	lb.	0	0	7¾	to		—	
Carbonate, 90%	ton	31	0	0	to	33	0	0
Chloride 80%	ton	15	0	0	to	20	0	0
Chlorate	lb.	0	0	4½	to	0	0	5
Meta bisulphite, 50-52%	ton	112	0	0	to	120	0	0
Nitrate, refined	ton	45	0	0	to	47	0	0
Permanganate	lb.	0	0	9	to	0	0	10
Prussiate, red	lb.	0	2	4	to	0	2	6
Prussiate, yellow	lb.	0	1	2	to	0	1	2½
Sulphate, 90%	ton	20	0	0	to	22	0	0
Salammoniac, firsts	cwt.	3	5	0	to		—	
Seconds	cwt.	3	0	0	to		—	
Sodium acetate	ton	25	0	0	to	26	0	0
Arsenate, 45%	ton	45	0	0	to	48	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	6	to		—	
Bisulphite, 60-62%	ton	25	0	0	to	27	10	0
Chlorate	lb.	0	0	3¾	to	0	0	4
Caustic, 70%	ton	24	0	0	to	24	10	0
Caustic, 76%	ton	25	10	0	to	26	0	0
Hydrosulphite, powder, 85%	lb.	0	2	3	to	0	2	6
Hyposulphite, commercial	ton	13	10	0	to	14	0	0
Nitrite, 96-98%	ton	37	10	0	to	40	0	0
Phosphate, crystal	ton	20	10	0	to	21	0	0
Perborate	lb.	0	1	2	to	0	1	3
Prussiate	lb.	0	0	9¼	to	0	0	10
Sulphide, crystals	ton	13	0	0	to	14	0	0
Sulphide, solid, 60-62%	ton	24	10	0	to	25	0	0
Sulphite, cryst	ton	13	0	0	to	14	0	0
Strontium carbonate	ton	60	0	0	to	65	0	0
Strontium Nitrate	ton	60	0	0	to	62	10	0
Strontium Sulphate, white	ton	7	10	0	to	8	10	0
Sulphur chloride	ton	25	0	0	to	27	10	0
Sulphur, Flowers	ton	13	0	0	to	14	0	0
Roll	ton	13	0	0	to	14	0	0
Tartar emetic	lb.	0	1	6½	to	0	1	7
Tin perchloride, 33%	lb.	0	1	2	to	0	1	4
Tin perchloride, solid	lb.	0	1	5	to	0	1	7
Protochloride (tin crystals)	lb.	0	1	5	to	0	1	6
Zinc chloride, 102 Tw.	ton	21	0	0	to	22	10	0
Chloride, solid, 96-98%	ton	35	0	0	to	40	0	0
Oxide, 99%	ton	38	0	0	to	40	0	0
Dust, 90%	ton	47	10	0	to	50	0	0
Sulphate	ton	18	10	0	to	19	10	0

Coal Tar Intermediates, &c.

	Per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	2	3	to	0	2	6
Alphanaphthol, refined	lb.	0	2	6	to	0	2	9
Alphanaphthylamine	lb.	0	2	0	to	0	2	3
Aniline oil, drums extra	lb.	0	1	0	to	0	1	1
Aniline salts	lb.	0	1	1	to	0	1	2
Anthracene, 40-50%	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	3	9	to	0	4	3
Benzidine, base	lb.	0	5	6	to	0	5	9
Benzidine, sulphate	lb.	0	5	6	to	0	5	9
Benzoic acid	lb.	0	1	10	to	0	2	0
Benzoate of soda	lb.	0	1	9	to	0	1	11
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	4	9	to	0	5	0
Betanaphthol	lb.	0	2	0	to	0	2	2
Betanaphthylamine, technical	lb.	0	6	0	to	0	7	0
Croceine Acid, 100% basis	lb.	0	3	6	to	0	3	9
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	3	0	to	0	3	6
Dinitrobenzol	lb.	0	1	3	to	0	1	4
Dinitrochlorbenzol	lb.	0	0	10	to	0	1	0
Dinitronaphthaline	lb.	0	1	4	to	0	1	5
Dinitrotoluol	lb.	0	1	5	to	0	1	6
Dinitrophenol	lb.	0	2	9	to	0	3	0

	Per	£	s.	d.		£	s.	d.
Dimethylaniline	lb.	0	2	6	to	0	2	9
Diphenylamine	lb.	0	4	3	to	0	4	6
H-Acid	lb.	0	6	6	to	0	7	0
Metaphenylenediamine	lb.	0	5	6	to	0	5	9
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	6	0	to	0	6	6
Monosulphonic Acid (2.7)	lb.	0	5	6	to	0	6	0
Naphthionic acid, crude	lb.	0	3	3	to	0	3	6
Naphthionate of Soda	lb.	0	3	3	to	0	3	6
Naphthylamin-di-sulphonic-acid	lb.	0	4	0	to	0	4	3
Nitronaphthalene	lb.	0	1	4	to	0	1	5
Nitrotoluol	lb.	0	1	0	to	0	1	2
Orthoamidophenol, base	lb.	1	0	0	to	0	18	0
Orthodichlorbenzol	lb.	0	1	0	to	0	1	1
Orthotoluidine	lb.	0	2	3	to	0	2	6
Orthonitrotoluol	lb.	0	0	10	to	0	1	0
Para-amidophenol, base	lb.	0	10	0	to	0	10	6
Para-amidophenol, hydrochlor	lb.	0	10	6	to	0	11	0
Paradichlorbenzol	lb.	0	0	6	to	0	0	7
Paranitraniline	lb.	0	3	6	to	0	3	9
Paranitrophenol	lb.	0	2	9	to	0	3	0
Paranitrotoluol	lb.	0	5	0	to	0	5	3
Paraphenylenediamine, distilled	lb.	0	11	6	to	0	12	0
Paratoluidine	lb.	0	7	0	to	0	7	6
Phthalic anhydride	lb.	0	3	0	to	0	3	3
Resorcin, technical	lb.	0	5	6	to	0	6	0
Resorcin, pure	lb.	0	7	6	to	0	7	9
Salol	lb.	0	2	3	to	0	2	5
Sulphanilic acid, crude	lb.	0	1	3	to	0	1	4
Tolidine, base	lb.	0	6	6	to	0	7	0
Tolidine, mixture	lb.	0	2	6	to	0	2	9

Metals and Ferro Alloys

The following prices are furnished by Messrs. Miles Mole & Co. Ltd., 101, Leadenhall Street, London, E.C. 3:—

	Per	£	s.	d.		£	s.	d.
Aluminium, 98-99%	ton	120	0	0	to	—		
Antimony, English	ton	36	0	0	to	39	0	0
Copper, Best Selected	ton	69	0	0	to	70	0	0
Ferro-Chrome, 4-6%	ton	25	0	0	to	26	0	0
Manganese, loose	ton	15	0	0	to	16	0	0
Silicon, 45-50%	ton	12	0	0	to	13	0	0
Tungsten, 75-80%	lb.	0	1	6	to	0	1	8
Lead Ingots	ton	25	0	0	to	26	0	0
,, Sheets	ton	35	0	0	to	36	0	0
Nickel, 98-99%	ton	180	0	0	to	—		
Tin, English	ton	169	0	0	to	170	0	0
Spelter	ton	27	0	0	to	28	0	0

Structural Steel

	Per	£	s.	d.		£	s.	d.
Angles and Tees	ton	10	0	0	to	11	0	0
Flats and Rounds	ton	10	0	0	to	11	0	0
Joists	ton	10	0	0	to	11	0	0
Plates	ton	11	0	0	to	12	0	0
Rails, heavy	ton	10	0	0	to	11	0	0
Sheets, 24 Gauge	ton	14	0	0	to	15	0	0
Galvanised Corrugated Sheets	ton	17	0	0	to	18	0	0
Zinc Sheets	ton	38	0	0	to	40	0	0

Potash

THE supplies of potash available from stocks on hand in England are very limited at this season, but large quantities of kainit, 14 per cent., and sylvinite, 20 per cent., are coming forward regularly at all the ports. Buyers are now more inclined to order *ex* ship, so as to obtain their requirements at the lower prices quoted for supplies sent direct from the ship's side. The additional charges entailed where fertilisers have to be sent into storage are now very heavy, so that often a considerable saving is effected on larger orders which can be bought ex-ship and railed direct to the farmer's station. Current quotations f.o.r. London are as follows:

	£	s.	d.
Kainit, 14 per cent. (K_2O)	2	12	6
Sylvinite, 20 per cent. (K_2O)	3	12	6
Muriate of Potash, 50 per cent. (K_2O)	10	10	0
Sulphate of Potash, 90 per cent. purity	14	10	0

There is every indication that the present low prices quoted for all grades of potash have been made possible only through adverse rates of exchange. It is doubtful if they can be continued during the spring months, when high freights may be expected. The much needed financial adjustment now pending may bring about higher prices.

Key Industries List

Merchants' Objections to Classification

A LETTER has been addressed by the Chemical and Dyestuff Traders' Association to the Board of Trade, respecting all the articles prefixed "R" in the list of articles chargeable with duty under Part I. of the Safeguarding of Industries Act, 1921. In this it is stated:

"We contend that the articles specified upon the accompanying sheets, including all the chemicals designated with the letter 'R,' are improperly included in the list of articles chargeable with duty under Part I. of the Safeguarding of Industries Act, 1921, for the following reasons:

(*a*) The remarks at the head of list H state that 'R' signifies that the chemical indicated is included only when it is 'pure,' 'puriss,' 'extra pure,' 'B.P.,' 'Ph. G.,' 'A.R.,' 'for analysis,' 'reagent,' or when it is of special quality for meeting special tests for purity, and not when it is the crude product.

(*b*) This definition is vague and ambiguous; does not embody a principle that can be readily understood and that serves for the sure guidance of officials in administrating the Act or for importers in making their calculations and arrangements; and inevitably creates uncertainty and irritation and acts as a serious restraint of trade, besides tending to divert trade into foreign channels.

(*c*) It is well known in the chemical industry that manufacturers of chemicals are constantly endeavouring to improve the purity of their technical qualities, and it is sound policy to encourage them so to do, as enormous volumes of products, textile and other, are thereby favourably affected.

"It is therefore contended that the principle applied should be that the duty falls only upon such chemicals when imported in qualities that have been specially refined and purified for pharmaceutical and analytical purposes, and that such chemicals imported wholly and solely for industrial purposes should not be subject to duty, even if they are technically pure."

December Trade Returns

Exports Lower by £3,500,000

PRELIMINARY figures relating to our overseas trade in December, issued by the Board of Trade, indicate a decline in imports and exports as compared with November. Imports at £85,312,000 are less by nearly £4,000,000; exports, totalling £59,375,000, are lower by £3,500,000, and re-exports have fallen by £600,000 to £9,204,000. The values of imports and exports for the year 1921 were little more than half the figures attained in 1920, but the values are, of course, not strictly comparable owing to the fall in prices. The total imports in 1921 amounted to £1,086,687,000 as against £1,932,649,000 in the previous year; exports £703,196,000, compared with £1,334,469,000; and re-exports £107,052,000, against £222,753,000.

History of Rubber Vulcanisation

AT a meeting of the Institution of Rubber Industry, held on Wednesday in the rooms of the Royal Society of Arts, John Street, Adelphi, London, Mr. Ashley Cooke in the chair, Dr. P. Schidrowitz read a paper on "Vulcanisation: Past, Present, and Future." After dealing with the origin of rubber vulcanisation, the author raised an interesting point with regard to the divergence in practice of Britain and the United States in regard to the amount of sulphur employed. He then gave a concise account of various types of plant and referred to the progress made in the control of heat. Dr. Schidrowitz outlined a number of methods and processes for direct and indirect vulcanisation with sulphur and for curing with substances other than sulphur, and, in conclusion, gave an amusing account of a visit to a rubber factory in the year 1943. A discussion ensued in which Dr. Stevens, Dr. Clay, Dr. Porteous, Major Smith, Messrs. Payne, Rogers, Fordyce Jones, Peachey, Mote, Franklin, Zorn, Standring, and Hatton took part. A fuller account of the paper and discussion will be published in THE CHEMICAL AGE next week.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.*

GLASGOW, JANUARY 11, 1922.

THE year 1922 has opened quietly and in a spirit of hopefulness, but so far there is an absence of material inquiries for chemicals of all kinds.

In the alkali and heavy chemical trade generally deliveries against consumption contracts are slow and disappointing. The recent small reduction in refined alkali 58 per cent. is not sufficient to stimulate consumption. Consumers continue to buy from hand to mouth.

Continental makers are offering more freely this week, but prices are not attractive and deliveries uncertain.

Until the depression in the iron and steel trades, in shipbuilding, and in textiles is removed there can be no real improvement in the chemical trade. To that end it is to be hoped that our statesmen will evolve some safe means of stabilising exchanges and making international trading a possibility.

Inquiries for export are limited.

A small business is passing in coal tar products and intermediates for the dyestuff trade.

Industrial Chemicals

ACETONE.—The market is still in short supply and prices are firming—£75 per ton asked.

ACID HYDROCHLORIC AND SULPHURIC are in poor demand. These acids are suffering from the dullness in the textile trade, bleachers' requirements being small. There is no inquiry for export.

ACID ACETIC.—A small local demand for 33 per cent. at £30 per ton. Some inquiry and business in GLACIAL, which inclines to harden. Business is still possible about £50 per ton.

ARSENIC.—Cornish White is maintained at £43 per ton. Parcels are being offered from the continent at prices which are not attractive.

AMMONIUM NITRATE.—Some large parcels, ex Government surplus recovered, have been disposed of recently around £25 per ton.

AMMONIUM SULPHATE.—Buyers are now interested for spring fertilising, and prices are stronger. Some fair transactions have been concluded around £14 10s. to £15, according to delivery.

BLEACHING POWDER 35/37 per cent.—No change, and small demand. German make is being offered in limited quantity about £12 per ton c.i.f.; home makers' price, £14 per ton.

CALCIUM CHLORIDE 70/75 per cent.—Continent offering at lower prices, but deliveries slow and uncertain; home make, £7 10s. per ton.

FORMALDEHYDE 40 Per Cent. VOL.—America offering around £55 per ton f.a.s. New York, but import is prohibited except under key industry conditions.

LEAD NITRATE.—Small business passing at £46 per ton.

POTASSIUM CARBONATE.—Market easier. Continent offering 85 per cent. at £26 and 90/92 per cent. at £28 per ton ex warehouse U.K.

POTASSIUM CAUSTIC 88/92 per cent.—A few parcels offering about £33 c.i.f. U.K. port. Demand small.

SODIUM BICHROMATE.—Small trade at 6d. per lb.

SODIUM CARBONATE.—Refined alkali 58 per cent. A reduction of 2s. 6d. per ton intimated from January 1 was welcome, but not sufficient to affect demand.

SODIUM CARBONATE (Soda Crystals).—£6 10s. per ton. Sales slow.

SODIUM METALLIC.—Norway offering slightly below British price.

SODIUM NITRATE.—Sales for prompt slow at the reduction of 2s. 6d. per ton. More inquiry for spring delivery. Ordinary quality, £13 17s. 6d. per ton ex warehouse or quay; £14 2s. 6d. per ton for 96/98 per cent. refined.

SODIUM NITRITE.—Inquiries limited at £30 to £35 per ton for 100 per cent.

SODIUM SULPHATE 95 per cent.—Offering at £4 per ton f.o.b. in bulk, but very few inquiries.

SODIUM HYPOSULPHITE (Commercial).—Continental in casks, £14 per ton; pea crystals in casks, £21 per ton. This quality is now subject to key industries duty.

SULPHUR.—Silician Thirds: Government stocks being rapidly reduced. For flowers, rolls, and refined rock there is very little demand this week.

Coal Tar Intermediates and Wood Distillation Products

ANILINE OIL AND SALT.—A fair business is being done at the reduced prices of 1s. and 1s. 1d. per lb. respectively.

BENZOL.—More offers are being made in view of probability of further coke ovens coming into commission shortly. Sales of pure at 3s., and 90° at 2s. 8d. per gallon have been reported for early delivery.

BETA NAPHTHOL.—Some inquiries for export, but German prices are much below what home makers can offer at. Home price, 1s. 8d. per lb.

BENZIDINE BASE.—A small export busines at 8s. 6d. per lb. f.o.b.

DINITROCHLORBENZOL.—A few orders for export on the market. £84 per ton asked.

DIPHENYLAMINE.—Few inquiries for export; 4s. 3d. per lb. asked.

DIMETHYLANILINE is offering at 2s. 10d. per lb.

"H" AND "G" ACIDS.—Some inquiry for export. Both around 7s. per lb.

METAPHENYLENEDIAMINE.—Some inquiry; 5s. 6d. per lb. asked.

PARANITROTOLUOL.—Switzerland offering at 2s. 9d. per lb. c.i.f. U.K.

PICRIC ACID.—Government surplus offering at 6d. per lb.

PYRIDINE BASE.—£55 per ton asked for British make.

SALICYLIC ACID.—B.P. CRYSTALS.—Lower prices. At 1s. 4½d. per lb. for British make.

TOLUOL more freely offered.

A Chemical Manufacturer's Affairs

THE first meeting of creditors under a receiving order made against Sydney Fleming (lately trading as S. Fleming & Co.), 47, Mark Lane, E.C., and 9, Shortlands Road, Shortlands, chemical manufacturer, on December 20 last was held last week at the London Bankruptcy Court, Mr. W. P. Bowyer, senior official receiver, presiding. The proceedings were on the petition of a money-lender, the act of bankruptcy being the debtor's failure to comply with the requirements of a bankruptcy notice. The senior official receiver reported that the debtor had not attended under the receiving order and the department were not aware of his present address. An inspector of the department had visited 47, Mark Lane, and reported that the debtor formerly traded there alone under the style of S. Fleming & Co., but disposed of his business in April last to a company called S. Fleming & Co., Ltd. The premises had since been re-let and the debtor was said to have gone to the Continent. The inspector also attended at 9, Shortlands Road, where the debtor formerly resided, but those premises had also been re-let. No particulars were available as to the debtor's liabilities or assets. The case was left in the hands of the official receiver for administration in bankruptcy.

Chemistry of Gallotannic Acid

AT a meeting of the Bristol and South Wales Section of the Society of Chemical Industry, held on January 6, Dr. N. Nierenstein read a paper on "Gallotannic Acid," in which he gave a short historical account of the chemistry of the acid from its discovery by W. Lewis in 1763. Dealing with his own researches on the subject, which he commenced in 1901, the lecturer compared the different formulæ prepared by himself and by the German chemist, Fischer. While confining his remarks chiefly to the chemical aspect of the subject, Dr. Nierenstein pointed out that a sound understanding of the chemistry of the tannins generally, and of the gallo-tannins in particular, must eventually be of the greatest value to the tanning industry. In this connexion he stated that a recent investigation had led to the discovery by him of a new tannin which is present in a plant closely allied to the cocoa plant. This tannin, obtained in crystalline form, was, he said, the first crystalline tannin of its kind.

Company News

NOBEL INDUSTRIES, LTD.—The transfer books of the preference shares will be closed from January 17 to 31, both days inclusive.

GOODLASS, WALL, & CO., LTD.—Warrants for six months' interest to December 31 last on the 7½ per cent. cumulative preference shares have been posted.

ROYAL DUTCH PETROLEUM CO., LTD.—A dividend of fl.150 per share and fl.15 per sub-share, on account of the prospective dividend for 1921 has been declared.

EAST INDIA DISTILLERIES & SUGAR FACTORIES, LTD.—The transfer books of the ordinary shares will be closed from January 16 to 31 inclusive for the preparation of dividend warrants.

CANADIAN EXPLOSIVES CO.—The directors announce a dividend of 1¾ per cent on the 7 per cent cumulative preferred shares for the quarter to December 31 last, payable on January 16 to holders registered at December 31 last.

BRITISH WINDOW GLASS CO., LTD.—Speaking at the annual meeting last week, Sir W. Sinclair said the directors had created an issue of 10 per cent. debentures for £200,000, redeemable at 110 on or before June 30, 1932, and it was proposed to issue approximately £145,000 immediately.

SOUTH AFRICAN CARBIDE AND BY-PRODUCTS CO., LTD.—The balance sheet as at September 30 last shows: Debit—Issued capital, £285,253; sundry creditors, £2,972. Credit—Cash balances, £6,481; preliminary expenses, £32,106; cost of equipment of works in South Africa, £244,798; working expenses, £986; sundry debtors, £282; management and office expenses, £3,572.

CENTRAL CORNWALL CHINA CLAY.—The report for the thirteen months to July 30 last states that since the formation of the company a total area of 230 acres of land has been acquired, and is now under construction and organisation. The directors have not pushed production owing to the slump and depression in the china clay market, and they considered that delay would effect a saving to the shareholders.

LAMINATED COAL CO.—The balance-sheet as at December 31, 1920, shows: Debit—Issued capital, £592,007; second mortgage debenture, £18,000; sundry creditors, £3,117; bank overdraft, £4.235; total, £617,360. Credit—Patent rights, machinery and plant, &c., £594,831; additional furniture, fixtures and fittings, £358; cash in hand, £3; preliminary expenses and cost of issue of debenture, £9,230; expenditure, £12,837; total, £617,359.

ASSOCIATED PAPER MILLS, LTD.—The directors have decided to postpone the payment of the half-yearly dividend, payable on January 1, on the preference shares. As soon as negotiations with the Inland Revenue authorities have been concluded, and the auditors have completed the balance sheet, the directors will be in a position to advise the shareholders of their decision regarding payment of dividend. The directors express the hope that the payment of the dividend will not be postponed longer than June 30 next.

LEVER BROTHERS, LTD.—Dealings in 718 seven per cent. preference shares of £1 each, fully paid, Nos. 23,566,294 to 23,567,011, and 232 eight per cent. "A" preference shares of £1 each, fully paid, Nos. 15,469,131 to 15,469,362, have been specially allowed by the Stock Exchange Committee under Rule 148a. These securities will rank *pari passu* with those in which special settling days have already been appointed, as soon as they are identical and the certificates are ready for distribution, and with those for which an official quotation has already been granted as soon as they are identical and are officially quoted.

BRITISH BURMAH PETROLEUM CO., LTD.—The report to July 31 last states that the balance transferred from revenue account amounted to £168,560. to which have been added difference in exchange £9,966, agency fees £3,049, dividend on shares in Rangoon Oil Co., Ltd., £14,346, interest and discount £24,498, and transfer fees £959, making a total credit of £221,378. Against this have been debited sundry charges in Burma, Bombay and London £70,577, debenture interest £35,012, and depreciation £22,455, leaving a surplus of £93,334. Adding balance brought in £14,403, surplus on realisation of investments £9,829, and refunds in respect of taxes £64,294, the disposable profit is £181,860, appropriated as follows: Interim dividend of 6d per share, paid July 8 1921, £62,268; sinking funds accounts, £43,497; additional 2½ per cent interest on second mortgage debenture stock, £1,156; leaving a balance of profit of £74,940. The directors recommend a balance dividend for the year at the rate of 12½ per cent. per annum, free of tax, payable February 28 to holders on the books on January 17. This dividend will absorb £62,268, and the year's dividends will then amount to £124,536, representing 12½ per cent., free of tax, as compared with £199,266, free of tax, for the preceding year.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. No.
Johannesburg	Chemists' proprietary lines	34
Belgium	Ferro - silicon ; ferro - manganese ; spiegeleisen, &c.	37
Copenhagen ..	Aniline dyes and chemicals	39
Malaga	Chemicals ; drugs ; and paints	43
Los Angeles ..	Industrial chemicals	52
San Francisco	Heavy chemicals	53
Argentina, Uruguay, Brazil & Chile	Perfumery ; toilet articles ; proprietary articles, &c.	56
Mexico	Drugs and pharmaceutical products	60
Mexico	Perfumery, &c.	61

Tariff Changes

SIERRA LEONE.—A Customs (Import and Export List) Order, 1921, effective as from January 1, imposes various regulations with regard to the description of goods in the bill of entry. The order may be seen at the Tariff Section of the Department of Overseas Trade, 18, Queen Anne's Gate, London, S.W. 1.

CANARY ISLANDS AND SPANISH NORTH AFRICA.—The importation into the Free Ports of the Canaries, and into Ceuta and Melilla of all kinds of goods originating in France, French Colonies, and Protectorates, except where the Government deems it advisable to permit entry, is prohibited.

POLAND.—As from December 24 last, the Customs duties on all goods imported into Poland, with certain exceptions, were increased by 25 per cent. These increases will not be enforced until January 24.

ROUMANIA.—The following export taxes, in lei per waggon, have been imposed: Charcoal, 250; pyrites, 50; and bauxite, 50.

SPAIN.—The rate of surcharge for January in respect of import and export duties, Customs fines, &c., paid in Spanish silver coins or notes of the Bank of Spain, has been fixed at 33.52 per cent., as against 40.95 per cent. in December.

FRANCE.—Among the provisions of the French Budget Bill for 1922 is a proposal that a duty not exceeding 1 per cent., *ad valorem*, should be levied on all goods imported into France which are not at present liable to Customs duty.

Dyeing of Cotton Goods

SPEAKING at the Manchester Rotary Club last week on the manufacture of coloured cotton goods, Mr. John Lomax emphasised the importance of getting more information concerning the needs of foreign markets. One of the troubles of the present time, he said, was to produce colours which would remain "fast" under the vicious treatment of present-day laundries. Tests and experiments were being made to produce fabrics which would stand this treatment, and the only way in which the difficulty could be met was by association with the laundries, and by putting their methods of washing on a more scientific basis. It was a fact that laundries used substances such as the bleacher would use if he wanted to take the colours out, but there was no doubt the difficulty would be removed shortly.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Partnerships Dissolved

PARKER, John, and HIGGINS, Eric Berkeley, soap manufacturers, 22, Lace Street, and 62, Dale Street, Liverpool, under the style of John Parker & Co., by mutual consent as from December 23, 1921. Debts received or paid by J. Parker, who will continue the business.

RICHARDSON, Arthur, and SHORROCK, John Marsden, dry soap manufacturers, 3, Church Bank Street, Darwen, under the style of The Darwen Dry Soap Co., by mutual consent as from January 5, 1922. Debts received and paid by J. M. Shorrock, who will continue the business.

Liquidator's Notice

BROTHERS' CHEMICAL CO., LTD. Meeting of creditors at liquidator's office, 46, Pall Mall, Manchester, Tuesday, January 17, 1922, at 3 p.m. Particulars of claims to William Bolton, the liquidator, by January 17.

Winding-up Petition

HERCULIN GLUE AND COMPOUNDS CO., LTD. A petition for winding up the company has been presented by C. H. E. Stevens, of Rye Hill, Cannon Road, Southgate, general merchant, a creditor, and is to be heard at the Royal Courts of Justice, London, on Tuesday, January 17. Kenneth E. Bartlett, 9, 10, Fenchurch Street, E.C. 3, solicitor for the petitioner.

Edinburgh Gazette

CENTRAL CHEMICAL CO., Victoria Works, Baird's Brae, Rockvilla, Possilpark, Glasgow. Meeting of creditors in this sequestration, chambers of Thomson M'Lintock & Co., C.A., 216, West George Street, Glasgow, on Monday, January 23, at twelve noon, to consider application for trustee's discharge.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

BEVAN, W. L., Morriston, chemist. £11 2s. November 7.

M. & P. ENTERPRISES LTD., 62, Bryanston Street, Marble Arch, wholesale chemists. £23 0s. 5d. October 31.

MEEK, H., 41, Prospect Street, Hull, chemist. £13 15s. 4d. November 1.

WEST HAM PHARMACY, 61 West Ham Lane, Stratford, chemists, £16 1s. 3d. October 26.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.*]

COOKE'S (W. R.) FINISHING CO., Ltd., Radford, bleachers. Registered December 24, £950 mortgage. *£13,500. June 28, 1921.

DYMOND TAR CHEMICALS & FUELS LTD., Liversedge. Registered December 22, £5,000 debentures; general charge.

MARVELLA PRODUCTS LTD., Cadoxton, soap manufacturers. Registered December 28, £4,000 (not excluding) debentures to National Bank Ltd.; general charge.

MORTONS (CASH CHEMISTS) LTD., London, W. Registered December 29, £3,500 debentures part of £20,000; general charge. *Nil. December 28, 1920.

VICTORS LTD., Manchester, chemical manufacturers. Registered December 24, £4,900 debentures part of £35,000; general charge. *£3,500. March 7, 1921.

WEST NORFOLK FARMERS' MANURE & CHEMICAL CO-OPERATIVE CO. LTD. (late WEST NORFOLK FARMERS' MANURE & CHEMICAL CO. (1920) LTD., King's Lynn. Registered December 24, charge, to Barclays Bank Ltd. *Nil. August 30, 1921.

Satisfactions

CHINA SOAP & CANDLE CO. LTD., London, S.W. Satisfaction registered December 24, £68,000, registered February 9, 1917.

SQUIRE (J. H.) LTD., Gorton, manufacturing chemists. Satisfaction registered December 28, £2,000, registered November 8, 1920.

New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C. 2:—

BERRY, WIGGINS, & CO., LTD., 3, Short Road, Stratford Market, London, E. 15, manufacturing chemists. Nominal capital: £1,500 in 1,500 shares of £1 each.

BRITISH PETROL & MOTOR EQUIPMENT CO., LTD., 3, Copthall Buildings, Copthall Avenue, E.C. To carry on the business heretofore carried on by The Petrol Users' Society, Ltd., and producers and distributors of petroleum and petroleum products, &c. Nominal capital: £100,000 in 100,000 shares of £1 each. Minimum subscription: 7 shares.

CARTER'S SLAG & PHOSPHATE CO., LTD., 50, Mark Lane, London, E.C. 3, general merchants, tar distillation and tar products, manufacturers and dealers in minerals, phosphates, &c. Nominal capital: £1,000 in 1,000 ordinary shares of £1 each.

CAVENDISH CHEMICAL CO. (NEW YORK), LTD., Rooms 82 and 83, Empire House, 175, Piccadilly, W., chemists, druggists, chemical manufacturers, &c. Nominal capital: £500 in 500 ordinary shares of £1 each.

CENTRAL COSTA RICA PETROLEUM CO., LTD., 20, Copthall Avenue, London, E.C. To examine and explore petroleum, oil, gas, and other mineral claims and rights, &c. Nominal capital: $1,000,000 in 200,000 shares of $5 each.

N. KENYON & CO., LTD., St. Stephen's House, Westminster Bridge, Victoria Embankment, London, S.W., civil, constructional, and chemical engineers, &c. Nominal capital: £1,000 in 1,000 shares of £1 each.

McVICKER, MORRIS, & CO., LTD., 79, Wool Exchange, Coleman Street, E.C. To acquire the rights of Edward Burden, to exercise and use in all countries his improved metal cooling and treating processes. Gas engineers and contractors, &c. Nominal capital: £2,000 in 2,000 shares of £1 each.

PALMOLIVE CO. (OF ENGLAND), LTD., 13-14, Great Sutton Street, Goswell Road, London, E.C., dealers in Palmolive Soap and other Palmolive products. Nominal capital: £25,000 in 25,000 shares of £1 each.

R. A. GILSTON & CO., LTD., exporters and importers of fertilisers, fertiliser materials and feeding stuffs, &c. Nominal capital: £500 in 500 shares of £1 each. A director: R. A. Gilston, 23, Devonshire Terrace, W. 2.

S. HEIM, LTD., 82, Fore Street, E.C. 2. Dealers in kieselguhr (diatomite) infusorial earth, colours, chemicals, and metals. Nominal capital: £1,000 in 1,000 shares of £1. each.

SOAP COOLING MACHINES, LTD., Fairy Soap Works, 90, City Road, Newcastle-on-Tyne. To acquire the benefit of certain existing inventions in relation to "improvements in machines relating to the manufacture and moulding of soap," and turn same to account. Nominal capital: £1,000 in 1,000 shares of £1 each.

SULPHATE OF ALUMINA CO., LTD., manufacturers of sulphate of alumina, manufacturing chemists, &c. Nominal capital: £6,000 in 6,000 shares of £1 each. A director: H. Wrigley, Ashville, 68, Church Road, Urmston.